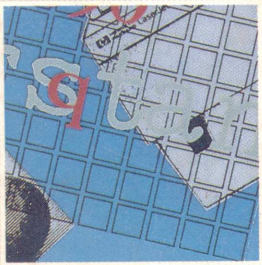


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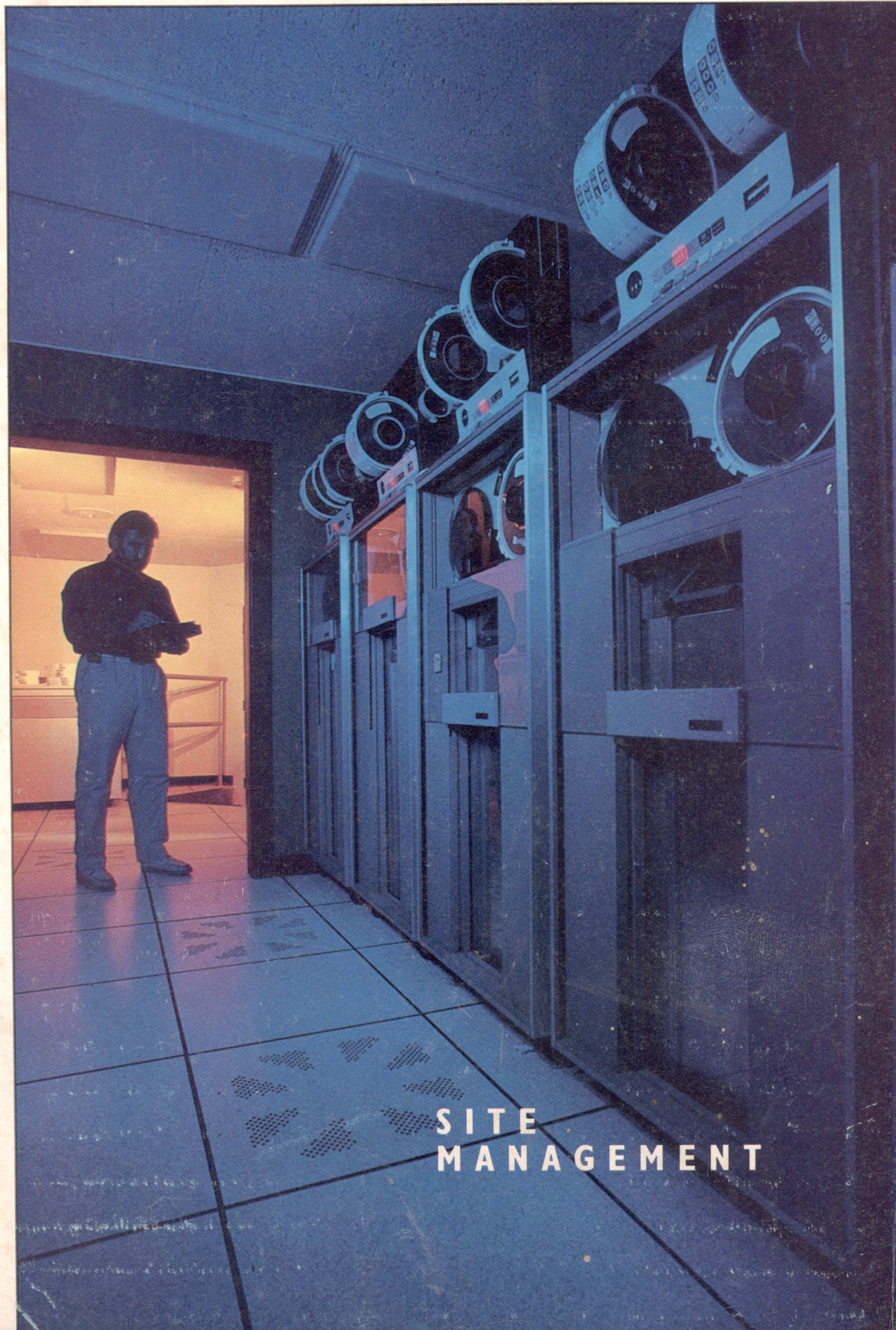
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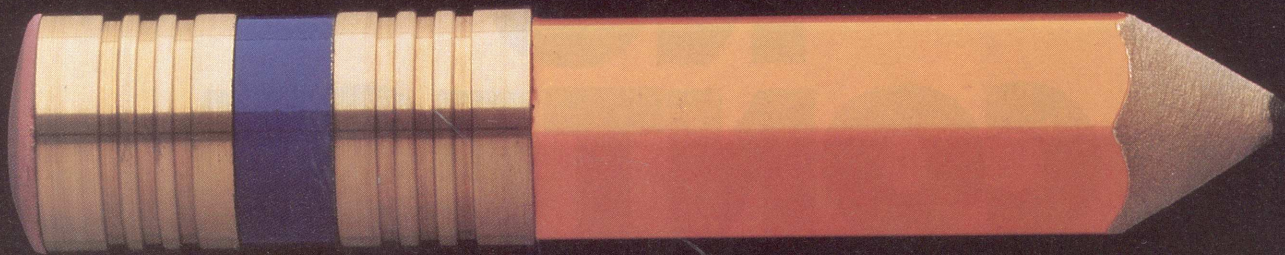
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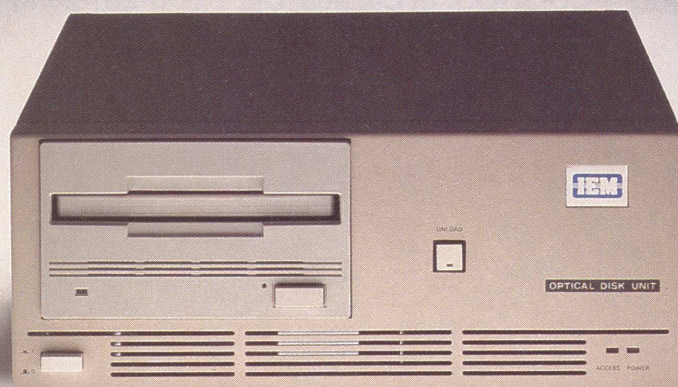


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# C CONTENTS

JULY 1990

VOL. 4, NO. 7

## 26 **FOCUS: Security Alert** by David W. Bynon

Taking Good Fortune For Granted Could Be A Welcome Mat For Disaster.

## 34 **FOCUS: Disaster Planning** by Peggy King

Take Necessary Steps To Prevent Unnecessary Loss.

## 42 **FOCUS: Ada Development** by Richard Riehle

Not Like Programming Using Other Languages.

## 52 **Multivendor LANs** by Robert S. Yori

Designing And Managing A System That Works.

## 60 **Wanted, Dead Or Alive** by Bill Sharp

HP's New Workstation Family Brings CISC Back From The Dead.



**EDITORIAL:**  
The People  
Problem ...p.8

**On The Cover:**  
Photo by  
Charles C. Place/  
Image Bank

### C O L U M N S

#### FROM THE LAB:

##### **Fastback Plus**

by Miles B. Kehoe

Fifth Generation Systems Gives New  
Meaning To Backup Utilities ..... 66

##### **SpeedMail Delivers**

by John P. Burke

Lee Merrick Addresses E-Mail System  
For The HP 3000 ..... 70

#### **RDBMS: Database Compliance**

by Fabian Pascal

Enforce Integrity To Prevent Data  
Corruption ..... 74

#### **FIELD SERVICE: Give Your Network A Physical**

by Ron Levine

How To Improve Reliability And  
Performance ..... 76

#### **PC TIPS: Option Orientation**

by Miles B. Kehoe

Utilize Microsoft Window's Features  
And Options ..... 80

#### **NETWORKING: The Blob Network Architecture**

by Gordon McLachlan

Making Sense Of Standards ..... 84

#### **UNIX: E-Mail Tips**

by Andy Feibus

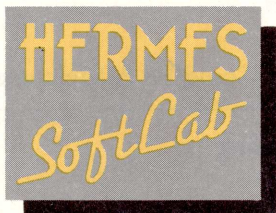
How To Receive And Send E-Mail  
Messages ..... 86

### D E P A R T M E N T S

<b>Editorial</b> .....	8
<b>Industry Watch</b> .....	10
<b>News &amp; Trends</b> .....	14
<b>Product Watch</b> .....	22
<b>Advertiser Information</b> .....	81
<b>New Products</b> .....	88
<b>Product Showcase</b> .....	92
<b>Software Directory</b> .....	94
<b>Career Opportunities</b> .....	95
<b>Advertisers Index/Calendar</b> .....	96



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# The People Problem

While the price/performance of computer systems continues to improve, new productivity tools are announced with regularity and computers are common in primary schools, there's still a general dissatisfaction with these devices — with what they do and how much it costs to do it.

When people find out that I'm from a computer publication, I feel like the computer doctor. They tell me all their ills. The stories are almost all the same: "I have this computer system — it costs too much and does too little; projects come in late and over budget; and I've become dependent on a resource I can't control or understand."

How many of us have participated in a project that came in late or that may have taken even twice as long as estimated? Did you ever work on a system that, when it was finished, wasn't quite right — that just didn't do the job the users thought it would do? Have any of you implemented a complicated system that required a systematic conversion from something else — and the users just couldn't understand how to get from here to there?

At Professional Press, we recently converted to a new accounting system. The conversion took a highly talented, experienced and hard-working person about one year to complete and required the cooperation of the entire accounting department and the understanding of almost everyone else. I'm convinced that a lesser person would have failed or required a huge amount of consulting time from the vendor, most of which would have been unbudgeted and would have resulted in a huge cost overrun. The accounting software is solid. So why was it so hard to get this done?

When we print *HP PROFESSIONAL*, our printer requires exact specifications, down to the last detail. He needs these because he programs the printing process. Nothing is left out. Can you spell out everything that needs to be done to accomplish a task?

For example, can you tell me exactly how to brush my teeth? Let's see — pick up the toothbrush (which end should I pick up?); open the toothpaste (where's the toothpaste?); put toothpaste on the brush (how much should I put on?); put the brush in your mouth (did I open my mouth first?); and brush (should the bristles point down or up?). You get the idea. We aren't used to specifying things in the detail necessary for any automatic process. The possible number of paths in any small program can be huge — in the thousands or millions — and a large, complicated program has astronomical permutations.

While computers have gotten faster, cheaper and (some say) better, people, sadly, haven't kept up. In "Educating The Next Generation" (March 1990), I complained that our schools aren't

properly training the next generation of computer programmers. But it goes beyond the programmers. The implementers and users have to take responsibility to "get the job done." If it doesn't work one way, then they have to find a way to make it work: Control the numbers in a conversion, work extra hard when changing from one system to another and, finally, understand what they're doing. The final job in any system is installation, training and support. This is usually accomplished by non-programmers.

A government official commented recently that every data processing project in his command takes longer than scheduled, costs more than planned and, worst of all, falls below expectations in what it accomplishes.

Unless we fix our trade, we could face a revolution that could change our workplace. We simply *have* to fix these problems.

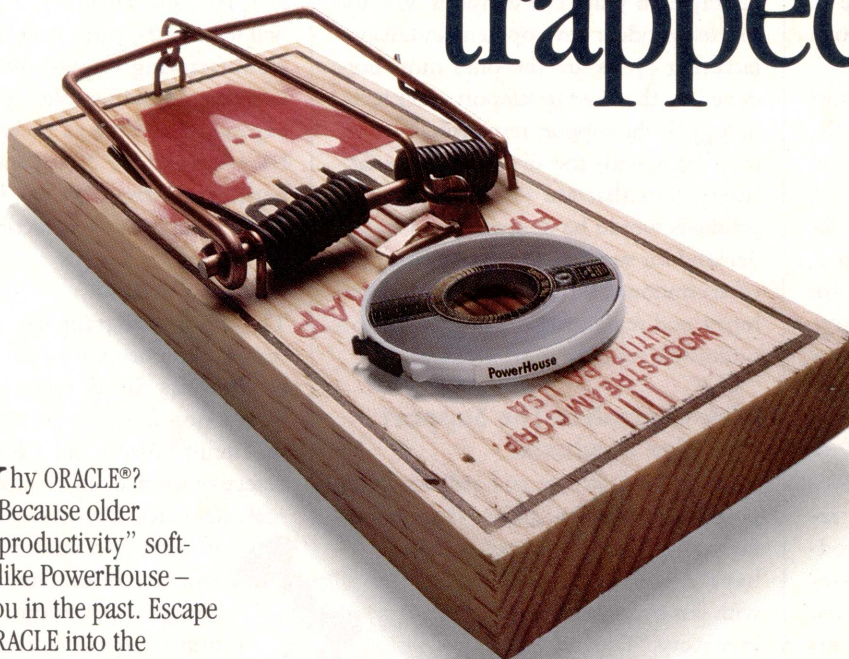
There are, of course, projects that come in on time, cost less than planned and do what was envisioned. There are professionals in our business who know how to plan, manage and implement systems. We need to increase the portion of the professional population that can do these things. Strive to be professional, work hard, concentrate, and keep learning. Take courses or attend professional trade shows where you can learn from the seminars. Insist on periodic training. Learn how to manage yourself, your projects and others. Help the next generation by telling schools and training organizations what we need.

While there are applications for which a computer will always be the obvious choice, there are others in which a group of accountants with green eye shades and quill pens *could* do the job. I recently saw a chart in which the cost of computer power between 1960 and 1990 was compared to the cost of an automobile during the same time period. If cars had improved as much as computers have in those 30 years, today a Rolls Royce would cost \$500 and get 300 miles per gallon. Unfortunately, we have the same drivers we had in 1960. In the computer business, people have become the weakest link. It's time to work on that problem.





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## INDUSTRY WATCH

Peggy King

Old HP Computers Never Die...

# Next Stop, Roseville

Old HP computers never die—they just move to Roseville.

HP's new headquarters for Support Materials Operation (SMO) in Roseville, CA is a rest home for equipment no longer made but still supported by HP. It's also an "organ transplant" center for worn-out motors and burned-out processors, and a make-over clinic for boards that need updated firmware or replacement chips before they go to new owners. Some of your equipment may end up there.

SMO has three basic operations, Post Production Manufacturing (PPM), Repair, and Alternate Sourcing. PPM replaces or repairs "post production" products within the agreed-upon, one- or four-day turnaround time for repairs and replacements specified in support contracts. Post production means that the five or 10-year clock for support has started ticking. The Repair group repairs components rather than products. It serves as a center for all of HP's component-level repairs including parts from Apollo workstations and medical and scientific instruments. The Alternate Sourcing group retrieves useable parts from salvaged equipment and passes these parts to PPM's inventory.

Until recently, each division was responsible for supporting products it no longer manufactured. Some divisions have the floor space, equipment, parts, staff and commitment needed to support their vintage products, but in others, the pace of change in the industry is so rapid that all of a division's resources are invested in getting a new product out in time for it to be competitive.

There is an industry-wide trend for shorter product lives, particularly for technical workstations. As a result, the

pool of discontinued parts grows more rapidly each year. The divisions with the shortest product development and manufacturing cycles are the ones most burdened by the need to support older technology. If the support responsibility were to remain with the divisions, manufacturing sites that are retooling for new products would be overwhelmed by the demand for supporting the growing pool of discontinued products. The centralized repair and replacement helps to insure a uniform level of support services.

### Why Centralize The Support Of Older Products?

A centralized facility and staff for post-production support means that manufacturing divisions can have a focused factory with less overhead and less inventory. The move to centralization also makes it possible to consolidate procurement and reduce the number of buyers.

When the manufacturing support of all computer-related post-production products has been transferred to PPM, it may become possible and even profitable for HP to extend the number of years that products are supported.

According to Program Manager Bill Harrer, PPM plans to "support older products as long as the customer wants the support, the technology remains available, and it makes economic sense for HP to continue the support."

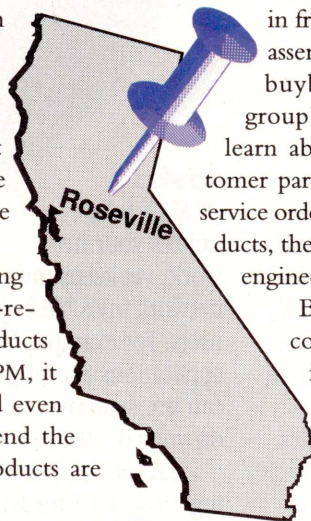
According to the plan, PPM will support all of the company's computers and peripherals by 1992. The first phase has begun this year as PPM is transferring support from the smaller, less expensive computer products. Divisions in Roseville, Corvallis and Grenoble that manu-

factured early model Vectras, portable PCs, HP 150s, Integral PCs and terminals will transfer the parts, documentation and manufacturing know-how required to keep them running. Next year, PPM will expand its services to include HP 9000s, HP 1000s and HP 3000s, and in 1992 the peripherals divisions are scheduled to transfer their post-production products.

### Repair Central

The repair program has a specialized team of engineers who do component-level repairs for all types of HP equipment. Most focus on detecting problems on circuit boards, and a few work with defective mechanical or electromechanical assemblies. The defective parts come in from field service and from disassembled machines purchased in buyback programs. The repair group's engineers and technicians learn about the problems with customer parts from reading the customer service orders. With post-production products, they learn by conferring with the engineers from the product divisions.

By centralizing the repair of components, HP has maximized its investment in expensive automated test equipment and realized some economies of scale from volume purchasing of standard chips.



### Stocking HP's 'Scrap Central'

The Alternate Sourcing program was established in September 1988, a year before the SMO site opened. Before a policy change in May 1989, HP was the last major computer hardware vendor to insist that only new parts be used to repair equipment.

The new policy, which allowed the use of equivalent-to-new (ETN) parts for



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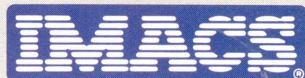
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repaired and refurbished equipment, meant that HP could profit from retrieving useable parts from older equipment and using them to repair post-production equipment. The new policy may also mean that the customer who would like to upgrade but can't afford the latest technology will be able to buy a good used board that was updated with ETN chips.

The Alternate Sourcing program started with HP's decision to buy old LaserJets for replacement parts because it was taking too long and costing too much to order the parts from Japan. About 80 percent of the equipment that Alternate Sourcing disassembles for its component parts is in useable condition, but these units are nevertheless more valuable to HP as a source of parts than as working units for resale.

There are several sources of used equipment for PPM's parts inventory:

- Finance and Remarketing Division — units HP purchased as part of large deals but doesn't intend to refurbish.

- The "HP Buys HP" program — discarded equipment from major customers like Boeing and State Farm.

- Upgrade or trade-in programs — old processor boards or equipment that HP has purchased from customers.

- HP divisions — used equipment that Alternate Sourcing buys on a cents per-pound basis.

### Who Benefits?

SMO's centralized programs are a big plus for HP in numerous ways. The programs decrease dependence on outside suppliers, promote economies of scale in ordering generic parts, eliminate duplication of functions, justify the expenditures for automated testing equipment, make money on high volumes of scrap, and boost HP's reputation as a company that recycles.

What's in it for the customer? Whether SMO's new business practices are to be a boon or a bane depends on what type of customer you are. If you're with a small shop that buys new equip-

ment and keeps it for a long time, you may benefit by HP's new willingness and ability to extend the support life of products. If you work for a large company that participates in the "HP Buys HP" program, you may be happy to let HP get rid of the older stuff and pay you something for it. If you're a customer for refurbished boards from HP, you're also in luck. HP will have more of them to sell because the centralized repair program makes it possible to repair and update boards cheaply and pass on the savings through reasonable prices.

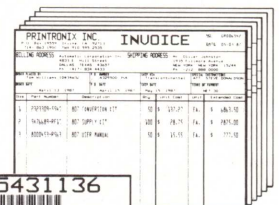
But if you're with a shop that has depended on old but reliable used equipment to keep your operations running (or to provide you with spare parts), the new policies may be a minus. If HP is successful in bringing its older members of product families back to the Roseville resting place, there will be fewer of these reliable vintage machines left to run small businesses or fill up used equipment dealer's shelves.

## YOUR ONLY ALTERNATIVE



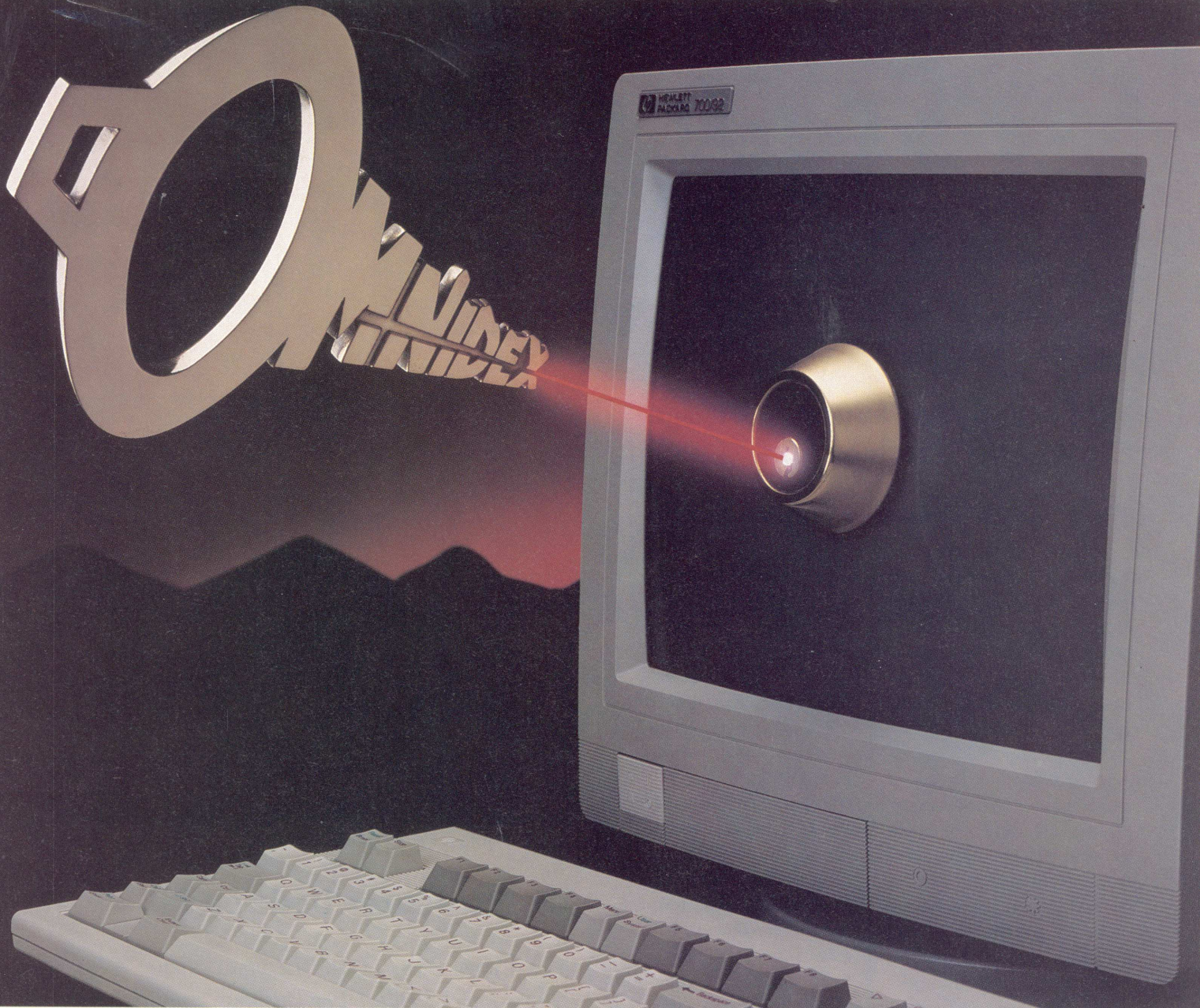
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## HP Establishes Support Bridge For Apollo Users

*Work-To-Completion Is A Standard Feature*

**H**P has announced the availability of HP ApolloLine, a program that provides support services for Apollo users that surpass those previously offered through Apollo support contracts.

The HP ApolloLine program consists of two hardware and operating-system support packages that resemble Apollo's former service programs. Apollo's Standard Support Agreement and Apollo Maximum Service have been enhanced under the HP ApolloLine umbrella, becoming HP ApolloLine System Support Service and HP ApolloLine Priority System Support Service, respectively.

The HP ApolloLine program gives customers two choices for supporting their layered software products: HP ApolloLine Response Center Support, which provides telephone assistance and update materials for layered-software products; or Software Subscription Service, which provides only update materials.

Both system support services include work-to-completion as a standard feature. This

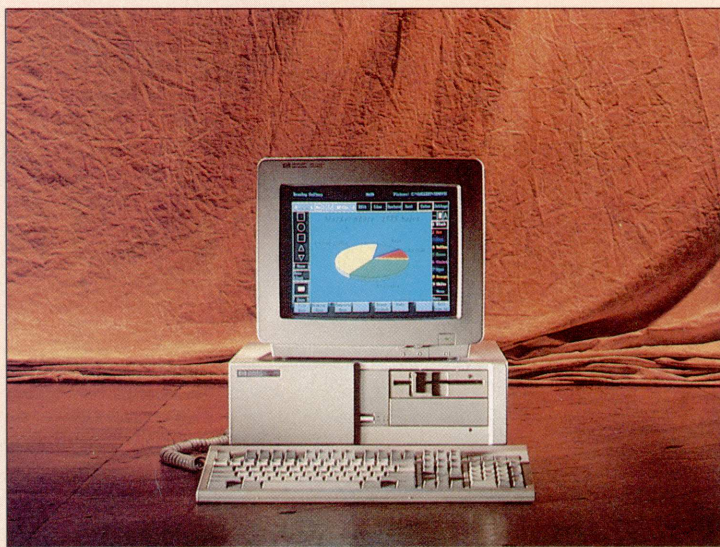
means that HP technical professionals remain on site as long as needed to resolve a problem.

HP ApolloLine enhancements that exceed the specifications of the Apollo support contracts include:

- Electronic access to HP SupportLine, a knowledge database at HP Response Centers for the latest software-problem fixes and product announcements.
- Local account representatives who answer questions about the support agreement or services.
- Extended on-site coverage hours for HP ApolloLine Priority System Support customers in most areas.

HP already has conducted extensive cross-training of Apollo and HP support professionals to broaden the company's service expertise.

In addition, HP has established a knowledge center in Chelmsford, MA. This facility focuses on workstations, UNIX system and LAN software, in addition to HP's worldwide network of response centers.



*HP's new low-priced Vectra 286/12 PC.*

## HP Introduces Desktop PC

*The Vectra 286/12 PC Becomes New Entry-Level Product For Business Application*

**H**ewlett-Packard has expanded its high-performance, industry-standard personal computers with the introduction of the HP Vectra 286/12 PC, a low-priced desktop machine that replaces the HP Vectra ES/12 PC.

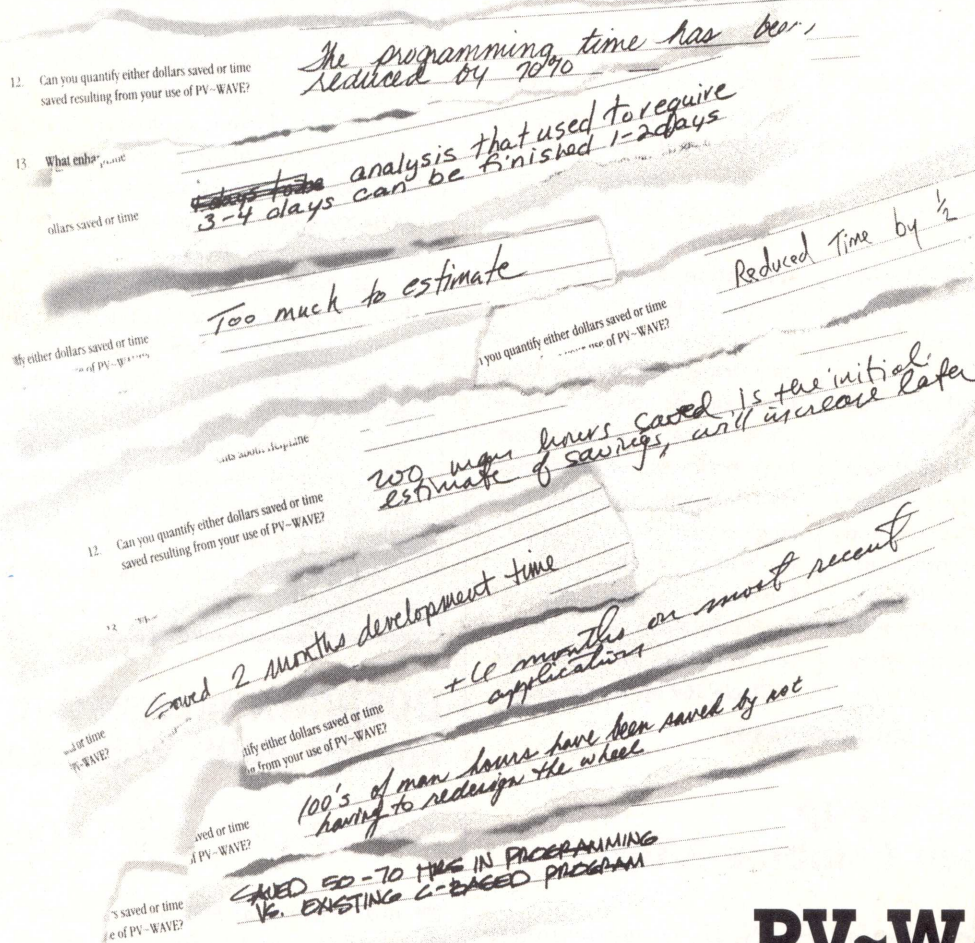
The HP Vectra 286/12 PC is a 12-MHz, 80286-based computer with 1 MB of zero wait-state memory. It features HP's new surface-mount technology (SMT4); embedded controller hard-disk drives; an extended-resolution, integrated, super-VGA video

controller; and reduced parts and power requirements.

The HP Vectra 286/12 PC's high-performance, integrated, super-VGA video subsystem is nearly identical to that used in the HP Vectra 486 PC, but is integrated on the main system board. The new PC supports the industry-standard (fully backward-compatible) VGA resolution of 640 x 480 as well as support for super-VGA resolution of 800 x 600. Prices range from \$2,099 to \$2,399.



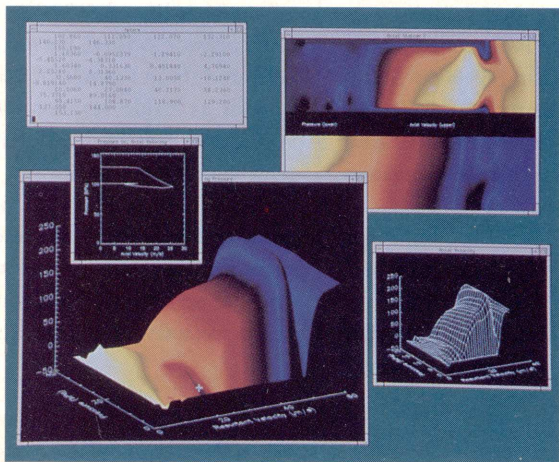
# Productivity? The Engineer's Definition:



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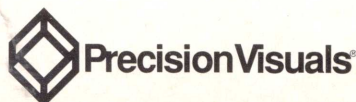
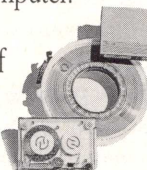
▲ Results taken from Precision Visuals 1990 Customer Survey.

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CIRCLE 264 ON READER CARD



## Cognos Announces Application Development/RDBMS For HP-UX

*PowerHouse Users Can Incorporate HP-UX Systems Into Existing Environments*

**C**ognos has announced its entry into the HP-UX application development/relational database management system (RDBMS) marketplace. Cognos' PowerHouse software, including the RDBMS PowerHouse StarBase is now available for the HP 9000 Series 800 computer line.

This UNIX system-based offering addresses the complete application development life cycle from analysis and design through the production and maintenance of business-critical systems. Now, PowerHouse users can incorporate the HP-UX systems into their existing computer environ-

ment. Cognos' application development software supports HP MPE V, XL, HP-UX as well as other midrange operating systems, OS/2 and MS-DOS.

PowerHouse, an HP-UX application development environment (ADE), has an integrated Data Dictionary. It also includes several advanced features such as automatic two-phase commit, SQL support, high-performance distributed data management capabilities, triggers, events and support for business rules.

Contact Cognos Corp. 67 South Bedford St., Burlington, MA 01803; (617) 229-6600.

**Circle 369 on reader card**

## SQL Access Group And X/Open Combine Efforts

*Developing Specification For SQL Interoperability*

**S**QL Access Group and X/Open Company Ltd. are working to develop a specification for heterogeneous SQL application portability and network communication database capabilities. The specification will be based on the existing X/Open Portability Guide definition for data management and the SQL Access Group's technical specification.

The SQL Access Group is comprised of systems and software vendors committed to defining a specification, based

on the existing SQL standard, enabling SQL-based relational databases and application tools from multiple vendors to work together. X/Open is a consortium of international computer systems vendors who are developing the vendor-independent Common Applications Environment (CAE). Contact Franson & Associates Inc., 2171 Campus Dr., Suite 260, Irvine, CA 92715; (714) 752-5942.

**Circle 368 on reader card**

## HP Extends NewWave Computing Strategy

*NewWave 3.0 Makes Information Easier To Acquire, Share And Manage*

**H**ewlett-Packard has announced HP NewWave 3.0 software, offering full agent capability and the ability to share objects on a network. HP NewWave 3.0 runs on Microsoft Windows 3.0, which also was recently announced.

HP NewWave is a software-applications environment that integrates applications from different PC vendors and helps automate repetitive tasks. HP NewWave runs on any industry-compatible MS-DOS PC with an Intel 80286 or 80386 microprocessor.

HP NewWave 3.0 adds several benefits to Microsoft Windows 3.0 in the areas of usability, integration of information and automation of tasks.

HP NewWave 3.0 will take advantage of enhancements made by Microsoft to Windows, including improvements to memory management and the user interface. Because of better memory management, HP NewWave 3.0 running several applications will require 2 rather than 3 MB of extended memory.

HP NewWave 3.0 can be ordered for \$195. Upgrades cost \$50.

## DOS/UNIX Integration Enhanced For HP 9000 Workstations

*SoftPC 2.0 Provides EGA Display Emulation*

**E**nhancements to HP's PC emulation product family based on a UNIX system are now available. The enhancements allow HP's workstation and multiuser-system customers to run DOS applications in an integrated UNIX system computing environment.

SoftPC Release 2.0, now available for HP 9000 Series 300 and Series 800 users and the DOS coprocessor Release 2.1, are the first PC emulators that provide users with enhanced graphics adapter (EGA) display emulation and scalable DOS windows.

The DOS coprocessor system is a combined hardware/

software product that provides PC-AT compatibility with high-performance DOS requirements for the HP 9000 Series 300 Motorola 68000-based workstations. This system includes emulation software and an interface card with an on-board Intel 80286 microprocessor. SoftPC is a software-only PCAT emulator that now is available on the HP 9000 Series 800 PA-RISC systems and 300 workstations.

SoftPC 2.0 is \$700 per license and \$150 for media and manuals. The DOS coprocessor Release 2.1 is \$1,375 for the hardware, software and license.



# Massive Storage

2.5GBytes Mass Storage in a single, compact cartridge about the size of a deck of cards for HP 3000, 1000, and 9000 computers



## ECHO 4920

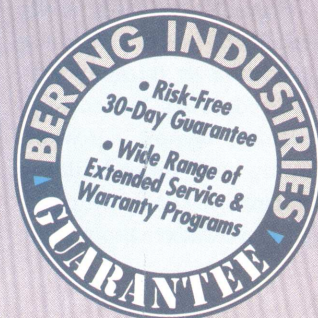
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CIRCLE 106 ON READER CARD



## HP Expands 9000 Minicomputer Family

*Investment In RISC  
Brings Performance Up, Prices Down*

**H**ewlett-Packard has expanded the entry-level segment of its HP 9000 product family with the Model 822S, a low-priced minicomputer aimed at distributed client-server office and lab environments.

The Model 822s, like all HP 9000 minicomputers, uses RISC to provide increased reliability and performance and a lower cost of ownership. The new Model 822s is U.S. list priced at \$27,900.

The HP 9000 Model 822s integrates a processor, up to four disk drives and a DAT cassette drive in a compact, desk-side unit.

With this announcement, HP now has 13 HP 9000 minicomputers running HP-UX and 25 minicomputers using Precision Architecture-RISC (PA-RISC), HP's version of RISC. Like all HP 9000s, the new Model 822s runs HP-UX.

## Frame Technology Announces Workstation Publishing Software For OSF/Motif

*FrameMaker 2.0-X Available  
First on HP, Apollo, IBM*

**F**rame Technology Corp. has announced that its FrameMaker 2.0 workstation publishing software will run on HP, Apollo and IBM's new RISC workstations under Motif, the X Window System-based user interface licensed by the Open Software Foundation (OSF). FrameMaker 2.0 Motif provides workstation users with a uniform "look and feel" across heterogeneous computing environments.

FrameMaker 2.0-X is the first Motif-based publishing application to integrate full-featured word processing, graphics, layout, equations editing and book-building tools into one complete package. FrameMaker also was the

first publishing software to run on the X Window System developed by MIT.

FrameMaker 2.0-X Motif initially will run on workstations from HP, including the HP 9000 Series 300 and 800, and the complete line of Apollo workstations. Frame also announced that a 2.0-X Motif version is under development for IBM's new RISC System 6000 family of workstations. In addition, a majority of Frame's OEM partners also have committed to porting 2.0-X Motif to their platforms in 1990.

Contact Frame Technology, 1010 Rincon Cir., San Jose, CA 95131; (408) 433-3311.

**Circle 376 on reader card**

## HP Chooses PROGRESS As Foundation Of OpenMFG

*MRP II Solution Runs  
On HP 9000 Series 800*

**P**rogress Software Corp. has recently announced that its PROGRESS fourth-generation language and relational database management system (4GL/RDBMS) has been selected by HP as the foundation of HP's new UNIX-based MRP II software application package, HP OpenMFG.

HP OpenMFG is an integrated manufacturing resource planning (MRP II) solution for managing the sales order, inventory control, production, and financial functions of medium-to-large manufactur-

ing operations. HP Open-MFS runs on the HP 9000 Series 800 RISC minicomputers.

PROGRESS features a client/server architecture and supports ANSI-standard Structured Query Language (SQL). In addition to UNIX, PROGRESS is portable across XENIX, ULTRIX, AIX, DOS, VAX/VMS and CTOS/BTOS operating systems, as well as networks.

Contact Progress Software Corp., 5 Oak Park, Bedford, MA 01730; (617) 275-4500.

**Circle 380 on reader card**

## IBI Integrates FOCUS 4GL With LEVEL5 Expert System

*LEVEL5 For FOCUS Provides  
Knowledge-Based Applications*

**I**nformation Builders Inc. (IBI) has announced the integration of LEVEL5 expert system with FOCUS fourth-generation language (4GL), to develop FOCUS applications containing embedded knowledge. LEVEL5 for FOCUS provides the capabilities to perform consultative queries, exception reporting and intelligent validation procedures against any database and all file structures in a data center, without leaving a FOCUS session.

Embedded in FOCUS, LEVEL5 is a fully optimized module that can be requested to apply expertise during a FOCUS transaction. Database

and user-supplied values are passed to a fully optimized, memory-resident knowledge base where the inferencing is performed. LEVEL5 returns the conclusions of its consultations to FOCUS.

LEVEL5 for FOCUS is available for all versions of FOCUS for IBM VM and MVS operating systems and DEC VAX running VMS. The full package requires FOCUS, the LEVEL5 development system and the LEVEL5 for FOCUS enabling component.

Contact Information Builders Inc., 1250 Broadway, New York, NY 10001; (212) 736-4433.

**Circle 379 on reader card**



# How Kelly unleashes HP performance.

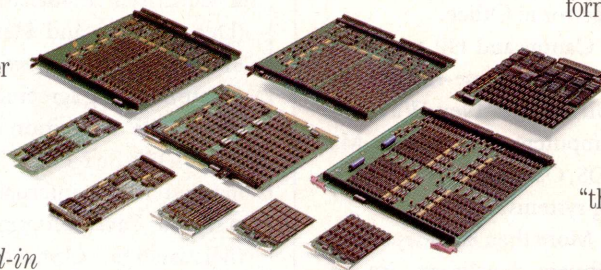
It's a Kelly tradition. Taking HP system performance to the maximum. Cutting through the restrictions. Overcoming the limitations — whether posed by CPU, memory or I/O.

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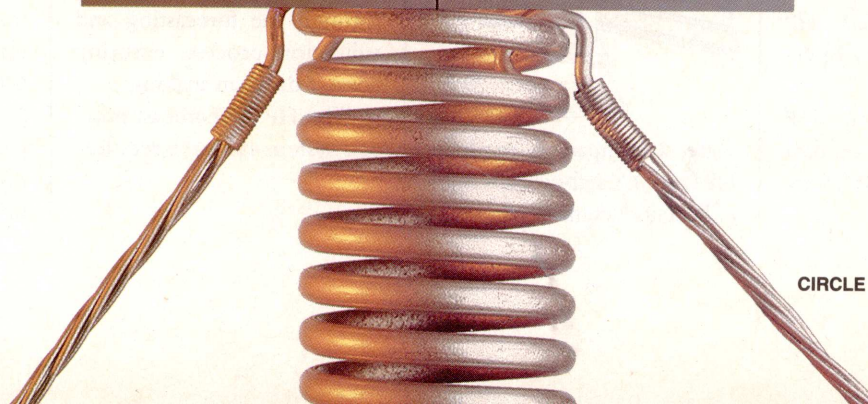
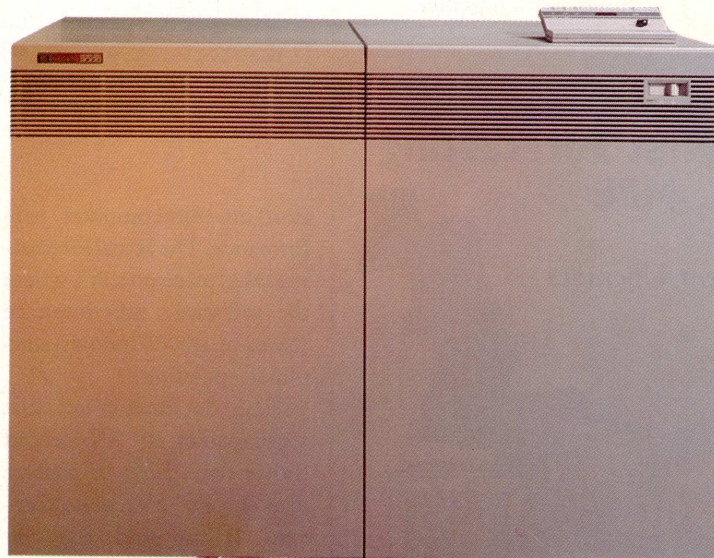
there's more to come.

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CIRCLE 185 ON READER CARD



# Hewlett-Packard Licenses NewWave To AT&T

## AT&T Committed To Industry Standards

**H**P has signed an agreement to license HP NewWave software to AT&T Computer Systems, both companies recently announced.

HP NewWave, which runs on top of Microsoft Windows, instantly integrates software applications and makes it possible to automate tasks. These capabilities are collectively known as the HP NewWave "desktop." AT&T Computer Systems will use the HP NewWave desktop as a component of selected networked-computing solutions.

NCR intends to incorporate HP NewWave into NCR Cooperation, a forthcoming office-automation system that is based upon the company's Open, Cooperative Computing Architecture.

Data General plans to use HP NewWave in the company's Distributed Applications Architecture and Common Electronic Office.

Canon and HP are developing a Japanese-market version of HP NewWave for computers that run on MS-DOS, OS/2 and UNIX operating systems.

More than 80 independent software developers are developing applications based on HP NewWave. In addition, more than 50 companies, including HP and AT&T, have joined the Object Management Group to establish a common applications environment that will improve the way computer hardware and software from different manufacturers work together.

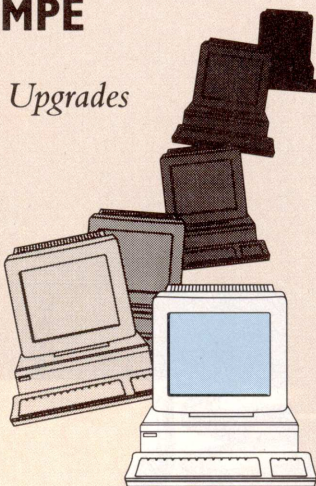
## HP Introduces First Forecasting Tool For HP-UX, MPE

### Helps Users Plan System Upgrades

**H**P has recently introduced a software product that helps data processing professionals forecast when to upgrade company minicomputers and purchase new systems.

HP RXForecast software is available for the HP-UX, HP MPE V and HP MPE XL operating systems.

Projections from HP RXForecast are based on data generated by HP LaserRX soft-



ware, a companion product. HP LaserRX software lets users collect and examine informa-

## For Your Information...

■ Innovative Information Systems Inc. (IISI) has opened new offices at 1720 Amphlett Blvd., Suite 219, San Mateo, CA 94402; (415) 349-2990; and 801 Plaza Drive, Woodbridge, NJ 07095; (201) 855-5844.

■ McKittrick Associates Inc. (Denver, CO) and Hewlett-Packard have concluded a corporate licensing agreement for worldwide acquisition of the OMNIDEX Self-Paced Training Systems for internal use.

■ Brant Technologies Inc. (Mississauga, Ontario) has signed an agreement with Cognex Inc. of Toronto to distribute the Meccano Set expert system shell.

■ Software Systems Technology Inc., a New York consulting firm specializing in HP environments and financial software, has opened an office in London. The new office is located at Cinema House, 93 Wardour St., London, W1V 3TE; (01) 287-1188; (212) 964-9600.

■ MARTECH, a division of Martinsound Inc., has been appointed North American distributor of GFK memory products compatible with HP 1000, 3000, 9000 and HP-PA computers. These include: "fast RAM" upgrades for Series 9000 Model 318/330, cost effective upgrades for 350/370s and Precision Architecture and auto configuring boards for the 1000 Series.

■ OPT's (Rancho Cucamonga, CA) North American customers now can contact sales and support personnel by dialing (800) 858-4707.

■ Bridgeway Technology (Palo Alto, CA) has been appointed as a value added reseller for HP workstations and Frame Technology.

■ QMS (Mobile, AL) has reported record second quarter sales and profits. Quarterly sales (ending March 30) reached \$69 million, a 33.2 percent increase over the second quarter of fiscal 1989.

tion on minicomputer performance. The actual forecasting takes place on a PC, where the software's user interface (based on MS-Windows) simplifies operation.

The documentation that accompanies HP RXForecast shows users how to analyze data and make accurate forecasts. It also leads the user through the forecasting and validation process, ensuring correct decision making.

The HP RXForecast projects system-resource require-

ments, such as CPU usage, response time and disc I/O. In addition, system-resource uses can be forecasted in user terms by using business units, such as payroll, service, products and inventory.

The software runs on an HP Vectra PC or other AT-compatible PCs that are networked to HP 9000 workstations or HP 3000 minicomputers. The PC must have at least 640 KB of internal memory, a 20-MB hard-disc drive, an HP CD-ROM drive and a floppy-disc drive. The software is priced at \$3,400.



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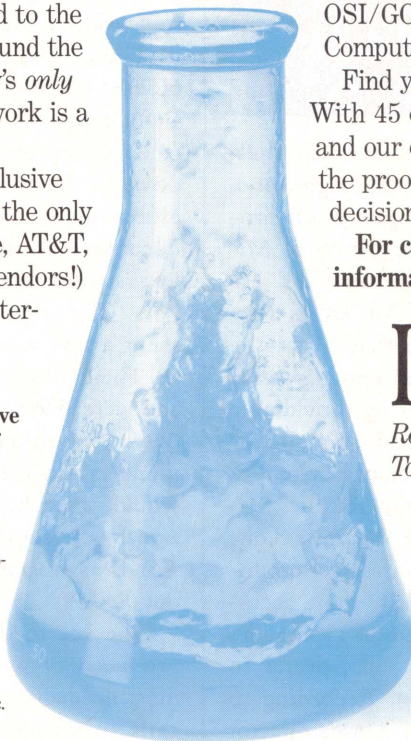
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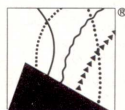
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**CIRCLE 249 ON READER CARD**



# NewWave Programming Made Easy



Photo courtesy of Hewlett-Packard Co

## Hobbes Application Programming Interface For Windows And NewWave

Hobbes, from Harris & Paulson Inc. (H&P; Englewood, CO), is an application program interface (API) to Microsoft Windows and HP NewWave. An API is a set of routines that hides the complexity of a programming environment by providing a standard way to communicate with the operating system or other low-level routines.

Microsoft Windows is one system that most programmers, especially those accustomed to COBOL applications on the HP 3000, prefer to keep hidden. According to Tim Sinclair, H&P's director of operations, "everyone knows that programming under a windowing environment is not an easy task."

With Windows, there is a very intricate set of messages that go in and out of a windowing application because the management of complex objects requires attention to low-level details. Adding NewWave to this concoction

is enough to perplex even an experienced C language programmer. According to Hobbes' creator Dave Thelin, "putting NewWave into an application makes putting in Windows look trivial."

Since 1977, Harris & Paulson has been a vertical market reseller for the legal services industry and they were among the VARs who made an early commitment to develop in NewWave.

Thelin originally wrote Hobbes because several H&P COBOL programmers needed to learn to program in Windows in order to work on client-server versions of document management and text retrieval systems for lawyers. These programmers spent a few weeks learning C. Then they used Hobbes and were able to write Windows applications in several months. Sinclair estimates it would have taken them over a year to become productive Windows programmers without the API.

The key to the increased productivity was programmers needed to write fewer calls to windows because Hobbes manages windows, objects and messages. Instead of making calls to the operating environment, programmers working within C application programs can use Hobbes to invoke any of several hundred functions. These function calls may replace up to dozens of lines of Windows-based source code. The Hobbes user's manual docu-

ments each function on a separate page. Each page that documents a function includes a listing and explanation of the function's input parameters and return values and examples of calls.

Because of Microsoft Windows' intricate message-passing system, programs written in windows are difficult to debug. The routines in each Hobbes function include complete error checking, error detection, recovery and debugging processes, thereby automating the process of debugging Windows. Parameter checking in Hobbes protects programmers from the type of errors that crash the operating system. When an error is detected, the programmer knows about the error through a context-sensitive pop-up message that provides specific information about it.

Another way that Hobbes increases programmer productivity is by making it easier to port windowing applications to different environments. NewWave is the first of what Harris & Paulson intend as a series of operating environments that Hobbes will support. They plan future support for MS-DOS character mode applications, OS/2 with Presentation Manager, and OSF/Motif. —Peggy King, West Coast Editor

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You can select from three hardware interface options. These options connect to the HP 3000 like a standard, direct-connect terminal and to a standard telephone line. Hardware options include FAXCOM from Biscom Inc.

(Billerica, MA), COMTEX and EasyFax units from Laboratorieservice AB (Molndal, Sweden), and intelligent facsimile machines like the Murata F-50 from Murata Business Systems Inc. (Plano, TX).

FAX/3000 is loaded with features. A cover sheet may be created and you also can integrate graphics such as company logos, letterheads, signatures and special forms, as well as scanned-in images from a scanner device.

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You can create and send documents with any HP or non-HP editor, formatter, utility or application program. FAX/3000 provides a set of commands that may be included in a separate file or at the beginning of your document. These commands let you specify the fax number to call, the names of the persons sending and receiving the fax, subject information, and transmission date and time.

You can submit a document to FAX/3000 from the MPE spooler, through an interactive dialogue, a programmatic interface, HP's HPDESK, or through PostHaste from Walker Richer & Quinn Inc. The most common input method is via the MPE spooler.

To submit a document from the MPE spooler, you change the file equation to

include the device class name of FAX/3000. The file equation becomes

```
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FAX/3000 then automatically removes the document from the MPE spooler. If the document is to transmit immediately, it's placed in a transmission queue. If not, it's stored until the time specified.

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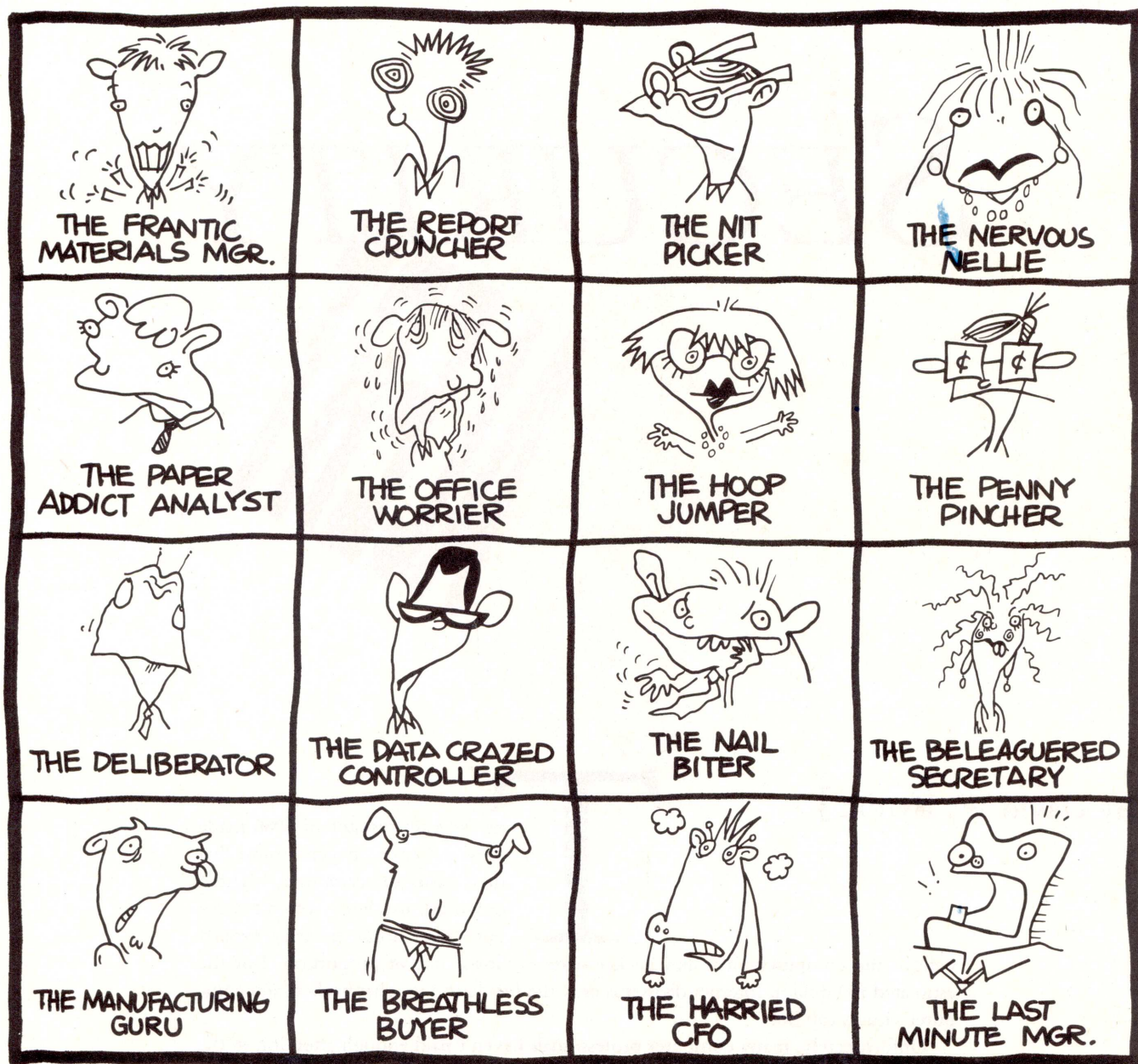
Prices range from \$5,595 to \$9,195.—George Frueh, Technical Editor.

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*Taking Good Fortune For Granted  
Could Be A Welcome Mat For Disaster*

# SECURITY



**[By David W. Bynon]**

**T**he Internet disaster of 1988 made some system managers realize that their years of screaming, "Batten down the hatches!" weren't without cause. Some industry experts believe the computer virus and hacker scare is blown out of proportion. But the estimated \$89 million Internet disaster is only the first lesson in what hackers and computer viruses can do.

Unfortunately, many computer professionals haven't paid enough attention to the problems of destructive software, file browsers, software and information theft, hackers and unauthorized use of system resources. The sad fact is that most security problems occur within our own user communities, not by hackers and viruses. If we leave ourselves open to attack, attack will come.

System security tasks fall into two categories: preventative and corrective security measures. The preferable preventative measures address issues such as physical security, software sources, and protection of communication devices, private information and critical system files. Corrective security measures include plugging newly discovered security holes, restoring files or discs after they've become corrupt or de-



stroyed, controlling users who are misusing system resources and protecting your system against skilled hackers hell-bent on breaching security.

## Security Policy

**E**STABLISHING A SECURITY POLICY is the key to preventative and corrective security. It's a simple document that outlines potential security problems, security rules and enforcement. It should be used as a basic tool to guide, among other things, the assignment of new user accounts, the use of passwords, default file protection and user access. The security policy should clearly outline the organization's computer-use policy for users. The policy should be distributed to all users, and regular checks of the file system and accounting logs should be made to ensure compliance.

A typical security policy will describe such things as:

- Who should have access to valuable/sensitive information.
- From whom valuable/sensitive information should be protected.
- How valuable/sensitive information should be protected.
- How valuable information will be restored if it's destroyed or deleted.
- How the system will be protected physically.
- Who should have access to the system and when.
- How users can access the system.
- Who's responsible for system security.

From this information, the plan can describe the methods to be used to protect the system and its information. For example:

- Default file and directory protection.

- Application of Access Control Lists.
- User log-in times and access methods.
- Backups and off-site storage.
- Physical security devices, such as locks and alarms.
- Special devices, such as port controllers, call-back units and encryption.

If the system is isolated from the outside world and has a small user community with similar work interests, then a relatively lax security policy can be employed. If the system is large, has a high public profile and many different user groups or contains sensitive information, then the security policy must be more restrictive.

The primary responsibility for complying with the security policy falls on the user community — provided it has received a copy of the policy, and the policy has been explained. However, the responsibility of ensuring that adequate protection is in place and enforcing the security policy belongs to the security administrator.

## Physical Security

**T**HE MOST SECURE COMPUTER system is one that's locked in a room and has no external connections. Some situations require this security measure, but it isn't the norm.

In all cases, however, the primary security of a system relies on good physical security. If you can prevent access to the machine, either by keeping it behind locked doors or by having no external connections (such as networks or modems), you can almost guarantee security. A secure system has no external

## [ SECURITY, STEP BY STEP ]

To fix an actual or attempted security breach, follow three basic steps:

**Step 1: Fly low, stay cool and face the facts.** Don't announce to the world that you've had a break-in or what you're going to do about it.

The first reaction to a suspected attack usually is denial. And why not? We always can think of good reasons for things that are a little odd. But never deny an attack or its importance.

**Step 2: Identify the perpetrator.** This is easy if the hacker is authorized and you have adequate alarms set. If you think you have a hacker with an authorized account, enable file auditing on all files. This will simplify identification. If the system is in a network, you'll have to inspect the log files that were created at the time of the file access violation.

Identifying the unauthorized hacker, one who doesn't have an account, is difficult. This is usually the case because most sources are anonymous, as from a dialup line. Usually, the only way to catch someone trying to break in is to continue letting him attempt entry while establishing his identity.

**Step 3: Prevent security violations of the same kind.** For example, if you believe that an authorized user is attempting to break in to other accounts, pre-expire all user account passwords, use a password generator for all user accounts and disable user accounts after repeated log in failures. If you think that someone is trying to break in through a dialup line, shut off the modem and have the phone number changed immediately. And, if you haven't already done so, protect the dialup lines with a system password or modem security device.

If you believe that your system has been infiltrated by a Trojan Horse, virus, data diddler or worm program, your recovery procedure should be drastic. Immediately back up all important information, then initialize or reformat all of your storage devices. If possible, boot from an alternate system disc before performing the backup. Operating system software, utilities and user software should be reloaded from the original distribution. Unless you're certain that backups haven't been affected, don't restore from backup media. —David W. Bynon



data connections except for hard-wired terminals (protected by a user name and password) kept in locked rooms.

The security policy should define the methods and devices used to secure the system physically from tampering and theft. The system manager and operators are responsible for defending the machines, but the security administrator is responsible for ensuring that security controls are used properly.

### System File Security

**T**HE SECURITY POLICY ALSO should define the system resources to be protected and the degree of protection. Adding this information to your security policy is a good idea, because it makes you think about where the system's weaknesses are.

All multiuser operating systems have key files, such as an accounting or password file, that must be protected. Protecting these files is usually easy — simply apply the appropriate file protection.

If your security requirements are higher than average, more measures must be taken to ensure that protected files haven't been violated. This isn't hard. If the operating system offers a security alarm feature, it should be used on critical system resources. But don't go overboard. This kind of security feature can add a lot of processing overhead.

If the system doesn't have a security alarm feature or if you need more protection, write a program to check files for tampering. This is done easily with a file integrity database that contains key file information such as the key file name, checksum, file ID, creation date, date last modified, owner, size and file protection. After a baseline database with this information has been created, it can be used to validate file integrity.

The suggested way to use the file integrity database is to have a program read a record from the database and compare it with the current file information. The program should only report files that don't match their database record. To be effective, this reporting should be done on a regular basis, i.e., weekly, bi-weekly or monthly. If you modify a file being tracked, update the file integrity database immediately. This small chore can be worked into procedures or scripts used to manage the system.

### Software From Strangers

**A**NOTHER ASPECT OF SYSTEM security pertains to the software you load. Any software you load can have security traps added by the developer or by an enemy who may hold the software before you get it. The typical scenario is that the software will load and run correctly, but some part of it contains a breach. When software is run by someone with system privilege or superuser status, the breach is activated. With this type of software, either the machine is attacked or a

modification is made to the system to permit the perpetrator to break in.

It's unlikely that this problem will occur with commercial software, but uncertified software is suspect. Free software available from public bulletin boards or user interest groups is especially questionable.

The problem with most software attacks is that you usually can't detect the problem until after the damage is done. Be extremely prudent when adding unknown software to your system. If possible, examine the source code, compile it on the target machine, and test the software in a controlled environment.

A good security policy will define acceptable sources of software and procedures for testing unknown software before loading it on a critical system. Part of this procedure should be to log the source of all software.

The best way to identify a  
virus is to maintain a check  
sum database of all  
executable files.

The best way to identify a virus is to maintain a check sum database of all executable files. Most computer viruses attach themselves to executable files that run with privileges or super-user status.

The bottom line is: Don't accept software from strangers!

### Friends And Neighbors

**W**HEN A COMPUTER SYSTEM is shared, you must make decisions involving community access, i.e., how much you want users to share information. Normally, on a small computer system in which users share a strong community of interest, the system manager will make each user a member of the same group. Under this condition, users can share files at the group level, while individuals can protect files for their own use. On larger systems, in which many unrelated user communities exist, different groups should be created.

The security policy should define groups, default group protection and file sharing among groups. Users should know the group boundaries and the types of files they should protect from group and world access. The user community must be made aware that most security problems are internal.

The heart of any multiuser system security scheme is the login name and password. If potential outside attackers can be kept off the system, they can't cause any damage. This is why the security policy must define strict password security rules for sys-





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**CIRCLE 145 ON READER CARD**



tems that can be accessed by modem or network. Each user must defend passwords, but the security administrator is responsible for making sure passwords are protected.

Unfortunately, most users don't want to change passwords often, nor do they want to remember difficult-to-guess passwords. So, the security administrator must ensure that passwords are aged and that appropriate passwords are used. This usually is done by defining a password expiration date (30 days for high security, 60 to 90 days for moderate security) and a minimum password length (at least eight characters). On high-security systems, a password generator should be used.

### Auditing: The Ultimate Defense

**A**FTER IMPLEMENTING A SYSTEM security policy, some method of enforcement must be applied. This is done through auditing your own controls.

Why should you audit your own security measures? For explanation, consider a farmer who puts up a fence to keep rabbits from eating his carrots. Does the farmer assume that the fence is keeping the rabbits out? No, the farmer knows that some rabbits will try to dig under the fence. The farmer regularly checks the fence for holes where rabbits have tried to dig through. When holes are found, he fills them. These same "fence checks" are required for good computer security.

Security auditing is the act of logging events as they occur for later analysis. This requires forethought and diligence. You must know what your threats are, and you must check your audit trail regularly to ensure security hasn't been broken. A definition of your known or potential security threats should be included in your security policy. Don't be an ad hoc security administrator. Anticipate potential weaknesses before they become a security breach. Also, let users know what the potential security risks are. An informed user is a better user.

Where the operating system is unable to log events, such as a user logging in after hours or from a dialup line, system utilities must be used. Most multiuser operating systems, such as UNIX, maintain accounting information about user activity. The system accounting database is a wonderful source of information for locating actual or potential security problems.

Auditing is dictated by the security policy. For example, if the security policy cited user access time as a security concern, then user access times must be audited.

Security auditing should consist of automated procedures and random checks. For instance, a batch job that runs early each morning could search the accounting database for attempted break-in activity, users who logged in after hours, unusually high CPU consumption and improper file protection. The results could be sent by electronic mail for review when you log in. Perform such random checks as searching for unauthorized accounts, unfamiliar software in system directories and unexplained jobs running in batch.

The greatest asset a security administrator can bring to the system is knowledge. The more he knows about the system, the better he can protect it.

### Security Breaches

**A** SECURITY BREACH CAN BE internal or external. Internal and external security breaches are different problems, but they should be dealt with similarly.

Internal breaches can range from a user deleting a file that should have been protected from them to someone browsing through files and directories for employee records or trade secrets. These violations should be dealt with swiftly. In severe cases, the user's account should be disabled while an investigation takes place.

An external security breach usually starts with a hacker who wants to expand his skills at your expense. Most often, the hacker will break into your system, snoop through as many files and directories as possible, then leave without causing damage. Most hackers are aspiring computer professionals who enjoy the challenge of bypassing security for the fun of using a minicomputer or mainframe. However, there are perpetrators whose purpose is to steal information or damage the system.

In a typical break-in scenario, the hacker gets the number for your modem or network from a former employee (or he may be a former employee) or a network of hackers. He also could get the number by random dialing (most companies have a base number and several sequential numbers, e.g., 2100, 2101, 2102). The hacker then determines what type of system you have.

After the operating system is known, the hacker can attempt a break-in. Typical account names are tried until an unprotected account or an obvious password is discovered. The hacker then can browse through the system within the privilege and protection boundaries of the hacked account. Unfortunately, hackers trade phone numbers and account information, so if one hacker finds you, you soon may be hacked by others.

Most break-ins and attempts are detected easily by regularly auditing log-in failures. Typically, many log-in failures will be logged as someone tries to guess a password, or users will report unexplained log-in failure messages. Systems like UNIX can report the time of the last log in, and this feature should be used.

System security is a 24-hour job. You either have it or you don't. Take time to evaluate your security risk. If you don't have a formal security administrator, appoint one. If you don't have a security policy, put one in place. Above all, don't take your good fortune for granted. Sooner or later, the bug will bite you, and your job may be what gets the worst infection.

— *David W. Bynon is an independent computer systems consultant, based in Gaithersburg, MD.*

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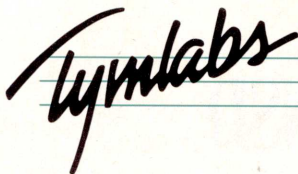


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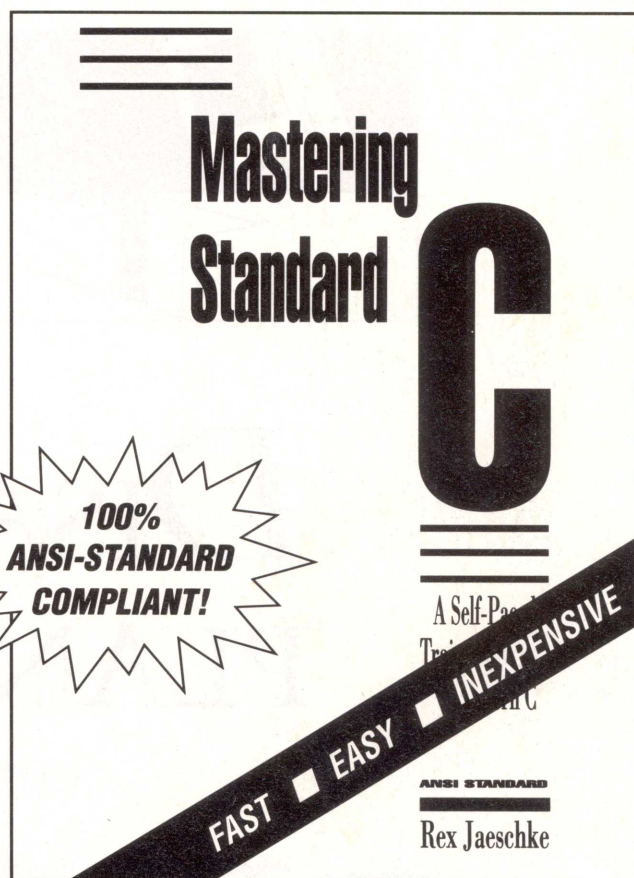
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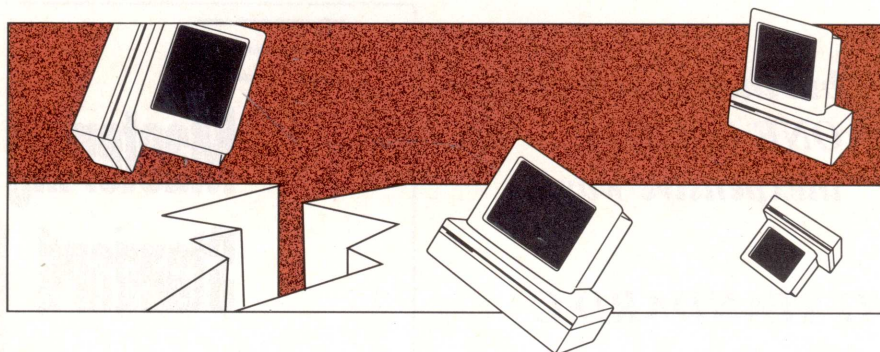
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## Take Necessary Steps To Prevent Unnecessary Loss



# DISASTER PLANNING

[BY PEGGY KING]

**C**ommunications are the lifeline of a business. If your computers go down for three hours during the work day, it's possible to catch up at night. But, if the phone lines are down during the same period, the lost business could be devastating — and there's no way to recoup it.

Because most businesses buy their communications equipment from a variety of vendors, it's hard to replicate a communications setup if any key parts are destroyed. That's why disaster planning is essential to prevent unnecessary loss and damage to your equipment and data.

The first step is to pay careful attention to details when you design a plan to protect your communications room or telephone closet. Keep a written log of the make, model, and capacity of every piece of communications equipment you purchase and include this information in your disaster plan. Also, understand your communications setup. Know where every cable pair and jack is connected, document these connections and make this information a section in your disaster plan. And, use a data line monitor to take a fingerprint of your system when it's working normally for heavy usage, normal usage and low usage. Data line monitors used to cost tens of thousands of dollars, but newer models cost between \$600 to \$2,000.

To ensure you'll be able to get replacement parts when necessary, check periodically with your communications equipment vendors to make sure



that the parts are readily available. If you learn that the part you're using is going to become obsolete, buy a spare and store it with your backup tapes.

And, if you have chosen one distributor to sell, install and service all of your communications equipment, see about adding backup support as part of your maintenance contract. Your distributor may be willing to negotiate an agreement for replacing all lost and damaged equipment within a designated time.

If your company has a digital PBX, consider investing in a power cutover box to redirect incoming calls and analog telephones for backup. Better yet, if your company has more than one site, consider having a backup phone system set up so that incoming calls can be rerouted. It's a good idea to get surge protectors for your data communications equipment if your area's communications lines are "dirty." Don't hardwire data communications equipment from one building to another because the buildings may have dissimilar grounds.

If you're planning a new site, consider separating your communications room from your computer room. The area that houses communications equipment should be located in the most secure place in your building. According to Bob Lanning of HP's Facilities Engineering, Corporate Computing Center,

the ideal housing for a PBX is a cubbyhole with four concrete walls in the interior of a building. James Depp of Up Time recommends a vault-like area with cap over it to seal out water, and equipped with its own air conditioning system.

## Protect Electric Power Lines

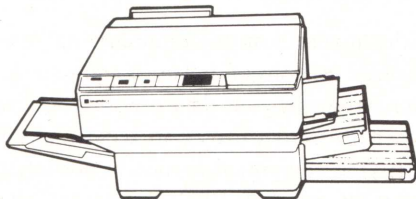
**I**F YOUR BUILDING HAS no office equipment more powerful than an electric typewriter, you may be able to take your electric power for granted. However, if your site houses a computer room or a PC LAN, you'll need to prepare for power surges, spikes, sags and brownouts in addition to outages and other emergencies that cause power loss.

Does this mean that you need to have your computer or LAN equipment on an uninterruptible power supply (UPS)? Not necessarily. According to Henry White, an HP Environmental Specialist, it's possible to do more harm than good with a UPS if you protect the "front door" (power lines) and leave the "back door" (telephone and datacomm lines) unprotected.

There are two forms of protection for power supplies: power conditioning and uninterrupted power. It's better to condition all of your incoming power than to provide uninterrupted

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power for just a few pieces of equipment. Before you buy, get the the advice of an expert other than the UPS salesperson.

In addition, you can condition the power that your site receives with an electronic filter or a surge protector to protect against irregularities in your area's power. However, if your site needs uninterrupted power, you'll probably need generators in addition to UPS-es. Lanning estimates that a UPS that could provide 20 minutes of backup power for a fully loaded Series 70 would run \$10,000 to \$12,000. In an emergency, the 20 extra minutes gives you enough time to do a controlled power down if the situation permits.

If continued power is essential to your operations, consider whether you need to run all or just some of your equipment. The bigger the generator, the more expensive it is and all types of generators have major drawbacks. You'll need to choose between buying a gas-powered unit that will make noise and emit fumes, a diesel unit that will produce soot and need frequent fuel changes, or a very large turbine unit that requires jet fuel and needs special mufflers and housing. Are you absolutely sure that you can't be without power for a while?

The utility company may provide "gas tubes," a type of slow surge protector. Don't count on these to protect modems and LANs. Buy surge protectors especially designed for data communications equipment. Don't get lured into a bargain. White cautions that those under \$100 aren't likely to be reliable.

If you have a UPS, get the unit checked on a monthly basis. Also check your unit after an outage that has activated the battery backup to make sure that none of the semiconductors have burned out. Don't buy a UPS with an automatic bypass if you live in an area prone to lightning storms. With the bypass, the lightning can go around the UPS and damage the computer system instead.

When workstations or other user-installed equipment are delivered to your site, use a power tester to check for open wires, miswirings and lack of grounding before you allow a user to do an installation. In order to insure the quality of power, don't extend a LAN more than 5,000 feet. Don't extend an RS-232 cable beyond 50 feet unless you have a fiber optic link at each end.

Have power lines checked during an annual site safety inspection. If you discover cables that aren't well grounded, find an electrician who can retrofit a grounding stringer. Have LAN cabling tested with a transmission medium tester to check for undetected problems with opens, shorts or bad connections.

If you're planning a new site,  
try to get a new ozone-safe  
halon fire protection system  
for your computer room,  
wiring closets, and  
telecommunications center.

If you plan to buy an older building, check the wiring carefully. Older wiring may not be properly sized for the harmonic currents generated by large computers. Find out what rewiring and power conditioning will be needed to make the power safe and reliable for data processing equipment.

Before you move into any building, conduct a survey to determine the quality of power in the area. Note that nearby overhead power lines can cause interference because of electromagnetic fields.

If the building you're considering shares data communication wiring with another building, get the building rewired before you move in. Dissimilar grounds can cause safety and operational problems.

## Options For Fire Protection

**Y**OUR INSURANCE COMPANY and the city building code demand a fire protection system. The problem is that fire protection systems designed to protect buildings can quickly damage data processing equipment. Even if you have a halon system, you also may be required to have a sprinkler system.

With a sprinkler system, just one unintentional five minute activation can damage millions of dollars of equipment. Whenever the sprinkler system in your data center is activated, regardless of whether it's from a fire or an accidental activation, bring in dehumidifying equipment as soon as possible to minimize the intermittent or eventual damage caused by damp boards and rusting parts.

Many sites that have a halon fire protection system have to keep a sprinkler system with automatic activation simply to comply with regulations. If you're doubly protected against fire, White suggests setting the temperature for the fire sensing heads that control the sprinkler system to 200 F instead of the standard 180 F to protect against sprinklers going off accidentally.

White also recommends installing a water sensing system. The major expense is the control panel. Detector units cost as little as \$25 per piece.

Large computers (Series 70 and up) come with temperature sensors that power down the machine automatically when they detect high temperatures. Consider installing temperature detectors in other mission-critical equipment, as well.

If you're planning a new site, try to get a new ozone-safe halon fire protection system for your computer room, wiring



# Why Adager?

## EASE OF USE

In 1978, Adager established the standards for friendliness, reliability and performance for HP3000 database software. You encounter the first of these hallmarks the moment you install Adager. To install your first Adager tape **you simply type four MPE commands**. With your future Adager updates, you follow the same procedure. It's that simple.

Running Adager is just as easy. You don't need any training—you simply log on and put Adager to work.

Adager places no restrictions on concurrent Adager use by multiple users in the same group and account. Adager lets you build an Adager job stream while other users are accessing the same database.

Adager's on-line help facility tells you how to use Adager. It can also serve as a tutor, giving you explanations on the nature of the operations, and information about specific database elements that you might want to change. Many Adager users invoke the help facility to learn about IMAGE as they learn about Adager.

The Adager session-mode dialogue is very friendly. Adager asks you questions one-at-a-time, and in typical Adager fault-tolerant style, lets you review the changes you have specified, whenever you want, before applying them to the database. At any point along the way, Adager lets you review the current state of the database with the report function.

The Adager User's Guide takes you through the Adager functions, command by command. Like Adager, it is thorough and easy to use.

## RELIABILITY

The Adager philosophy is easily expressed in one word—caution. Adager assumes nothing. About you **or** about your database.

**Adager protects you.** Adager does not permit you to breach any file system security. Nor does Adager allow you to violate any IMAGE rules. When you are in session-mode, if Adager finds that your specification is invalid, it will give you a chance to correct it on the spot.

**Adager protects your database.** When you call an Adager command, Adager **always** checks to make sure the structure of your database is stable **before** going ahead. Adager's "pre-process certification" assures that the privileged IMAGE tables are consistent; internally, as well as with all of the datasets of the database.

Adager's "in-process certification" monitors every operation as Adager goes about carrying out your request. If it runs into data-dependent problems, Adager will try to recover by itself, automatically fixing what it finds wrong before going on.

## PERFORMANCE

Adager's speed is legendary.

Adager minimizes wasteful operations by consolidating as many changes as possible into a single pass. Adager queues up the changes you want to make and then automatically applies them in the fastest possible sequence.

Thanks to Adager's own internal data structures, you can do things that would be impossible otherwise. For instance, you can simultaneously rename and relocate items and datasets without causing any confusion in Adager's logic, or you can easily specify changes in a recursive manner, such as requesting a path to a non-existing master dataset. (In this case, Adager will let you specify

the new dataset which, in turn, may have new fields that are not defined as items yet.)

To help you avoid I/O bottlenecks that slow your system's performance, Adager lets you move files (old or new) to the disc device of your choice. With Adager, you can actually specify disc location for **any** Adager function, choosing where **you** want your files to be built.

Adager speed is built on the cornerstone of Adager reliability. Thus, Adager never compromises your database's integrity for the sake of speed.

## SUPPORT

When you need help, expertise and experience count. At Adager, you will find the **same** people there today who were there when Adager was first introduced in 1978! At Adager, we have superbly qualified HP3000 experts ready to help you—including the creators of IMAGE and Adager: Fred White and Alfredo Rego.

This first-hand knowledge—and the many years of experience—of both IMAGE and Adager, has made us what many HP3000 users consider to be the top database support team in the HP3000 world.

The Adager team is ready to help you use Adager to its fullest advantage, for day-to-day maintenance and, when necessary, to put your database back together—after a hardware failure, for instance.

Adager support goes far beyond helping you with Adager—we will also help you with IMAGE—even if your question or problem is unrelated to Adager.

Getting in touch with Adager is easy. Adager's worldwide network of toll-free numbers, for both voice and fax, makes getting in touch with us fast and cost-free. And if you need to call us from an area of the world where this service is not yet available, you may call us collect via AT&T's USA/Direct service.

In addition to English, Adager offers French, German and Spanish speaking service to those who call on any of our toll-free numbers.

Hewlett-Packard supports Adager as part of the standard HP ResponseLine service, offering 24-hour phone-in support through HP's worldwide Response Center Network (Hewlett-Packard Software-Support Product Number: 35077).

## ONE SIZE FITS ALL

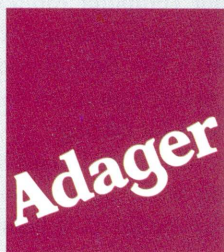
Adager software is as easy to buy as it is to use.

The *same* Adager software runs on **all** HP3000's, on **all** versions of MPE (Classic and Spectrum) and on **all** versions of IMAGE (IMAGE/3000, TurboIMAGE and TurboIMAGE/XL).

Adager prices are the *same* for **all** CPU models. With Adager, there are no hidden costs to complicate your job later on. This means that when you decide to upgrade your system (for instance, from a series 70 to a series 980) you won't have to pay an Adager upgrade fee. This saves you not only money, but often time spent on getting approvals and budget increases.

Adager's price structure is simple and straightforward—based on just two models: Adager **Model 1: Daily Maintenance** and Adager **Model 2: The Full Power**.

If you buy the Adager's Daily Maintenance model now, and later want to move up to the Full Power of Adager, you just pay the difference. And if your company, or group of companies, has more than one CPU, each additional CPU receives a discount of **up to 80%**.



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closets, and telecommunications center. To do so, you may need to negotiate with your insurance company and the city inspectors, but the advantages of halon are worth the trouble. It doesn't damage the equipment as water does and it's safer for people than a carbon-dioxide system.

## Protect Computers And Data

**C**OMPUTERS AND PERIPHERALS are expensive, but your company's mission-critical business data is priceless. Computers and disk drives can be replaced, but data can't. Fortunately it's easy to protect data: *Back up* all information on a regular basis and store the tapes in a safe place off site.

Computers are harder to protect, and there are some emergencies where it's impossible to protect them without jeopardizing the lives of people. A few minutes after the October 17 earthquake in San Francisco, Ray Schwarz, an HP Section Manager, ordered an emergency power off (EPO) for all the computers in HP's Corporate Computing Center. A controlled power down would've been easier on the computers, but that would have meant that people needed to stay in the building longer.

In a major disaster, your computers are likely to get gutted, burned or otherwise ruined, but they're insured. And that's why your company has a backup processing plan. Assume that you'll lose or damage your computing equipment, and concentrate on protecting people and other aspects of your business that are more difficult to replace. When the emergency situation has

abated, concentrate on getting backup processing and retrieving those tapes that are stored safely off site. After all, you lost your computers but you still have your data.

Don't expect equipment that's been water damaged or tossed around in an earthquake to run reliably even though it powers up and seems to work fine. Boards that have been water damaged are subject to intermittent failures, but it may be several months before you notice any problems. When in doubt, call your insurance company to replace distressed equipment.

Despite the convenience, don't have your backup storage location too close to headquarters. The nearby site is more likely to be affected by the same local or regional disaster that halted work at your company.

Off site storage isn't only for tapes. You also can use it for backup copies of any important manuals and hard copies of reports. It's also a good place to store an extra copy of the phone numbers of company officers and vendors who you'll need to contact in an emergency. And don't forget to keep the latest copy of your company's disaster plan there, too.

## Protect And Minimize Damage From Natural Disaster

**I**F YOU'RE PLANNING A two-story site, should the computer room be located upstairs or downstairs? That decision depends on the type of natural disasters most likely to strike your area.

For example, in an area prone to earthquakes, it's good to locate your computer room on the ground floor to minimize vibration. But make sure that the room is well insulated against burst pipes from the second floor. If your area is prone to heavy storms and flooding, locate your computer room on the second floor, if you have that option.

There's plenty you can do to minimize non-structural damage. For example, use Quake/Grip from Velcro, USA (Capistrano Beach, CA) or other industrial strength Velcro to fasten CPUs, monitors, keyboards, instruments, etc. to surfaces that support them. Brace bookshelves and other heavy furniture to walls and use heavy duty screws.

Protect reel-to-reel tapes with a flexible threaded rod system that allows the racks to sway without breaking. Bolting tape racks to the floor or ceiling may keep the racks upright but not prevent the tapes from flying across the room. And, add a protective ridge to racks that store cartridge tapes.

Retrofit all cabling holes in your computer room's raised floor with a lip that's tall enough to prevent machinery on casters from falling into the holes. At HP's Bay Area divisions, the main cause of damage in computer rooms with raised floors was from equipment that fell into the holes for cabling.

Secure all water heaters in the building and brace all lines carrying liquid substances including water lines, sewer lines, drains sprinkler lines and overhead air conditioning lines. Don't

### PANEL OF EXPERTS

The following people contributed site safety suggestions.

Patricia Castro, HP Corporate Facilities Operations Manager, Corporate Real Estate, Palo Alto, CA.

Robert Crosby, HP Customer Engineer, Columbia, SC.

James Depp, Vice President, Up Time, Sacramento, CA.

G.R. Falls, HP Customer Engineer District Manager, Charlotte, NC.

Michael Johnson, Facilities Manager, HP Corporate Site Services, Palo Alto, CA.

Bob Lanning, Facilities Engineering, HP Corporate Computing Center, Palo Alto, CA.

Jan Sah, Systems Manager, Speckels Sugar, Pleasanton, CA.

Henry Sanchez, Environmental Specialist, HP Neely Sales Region, Santa Clara, CA.

Ray Schwarz, Section Manager, HP Corporate Computing Center, Palo Alto, CA.

Belinda Tovar, Systems Consultant, HP Neely Sales Region, Santa Clara, CA.

Henry White, HP Environmental Specialist, Memphis, TN sales office.



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HIBARS*(HI-COMP BACKUP ARCHIVING RETRIEVAL SYSTEM)	03/90	N/A	N/A
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just do the ones that are visible — remove the ceiling tiles and brace any overhead lines, too.

If your computer room has overhead lines that carry liquid (for example, your air conditioning system may have a water reheat coil), install a drip pan underneath the lines and above the ceiling tiles.

If you plan to build a new site, get a geologist to do a report on the land before you commit to it. Even within one area there can be great variations in soil and ground water. An area with relatively stable ground may be only a few blocks from an area built on a landfill that will liquefy during a quake. Even if you're planning to rent or lease, have structural engineers do thorough inspections before you make a decision.

When heavy storms are expected in your area, the best protection is to seek high ground, even if it's the second floor of your building, and take all equipment that's small enough to move, as well as tapes, manuals and important papers.

Before the storm arrives, shut off all units that can't be moved. Cover big machines with thick plastic secured by tape. Protect smaller computers and peripherals with plastic garbage bags taped shut.

Bring in dehumidifying equipment as soon as you can get back in the building. Pull the boards from the computers and

use a hair dryer to dry the contacts. If salt water got into the machines, assume that they'll corrode and call your insurance company about replacing them.

Sop up all excess water as soon as possible. Michael Johnson, a facilities manager at HP's corporate headquarters, has constructed portable battery-operated pumps made of a battery-operated bilge pump from a boat, a hand truck for portability, a marine battery with charger, 100 feet of swimming pool discharge hose and a battery operated light. Johnson estimates that the materials cost \$200 and they're useful in any situation where there's standing water.

Windowless computer rooms are most secure from water damage. But if you can't do without windows, use a few small, wire-reinforced windows.

Would you like to continue to see articles on this topic?

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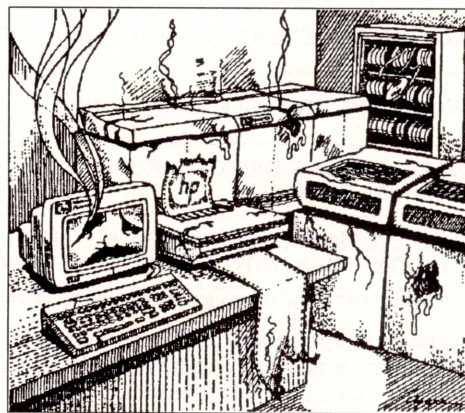
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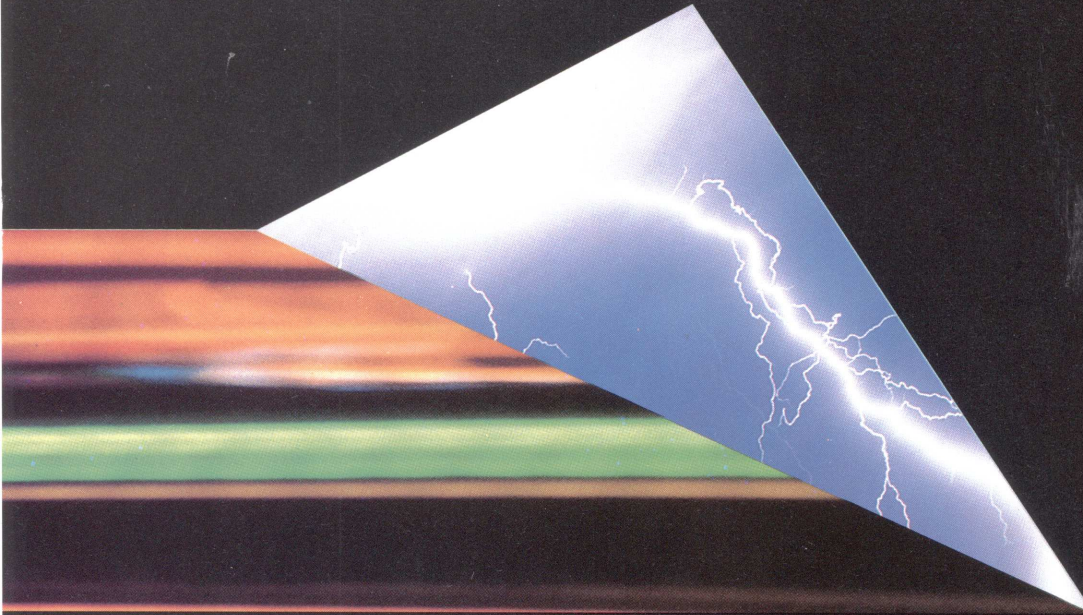


### But what if...?

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# Ada Development

.....

▲

## Not Like Programming Using Other Languages

▼

**H**ewlett-Packard's success in the acquisition of important Ada contracts has persuaded a large number of system software developers and vendors to provide "tools" for HP environments. Some of these tools are used for computer-assisted software engineering (CASE), some for software metrics, and others for validation and verification (V&V).

HP provides a development concept called CASEdge, which includes HP-developed tools such as Softbench. CASEdge is designed as an open environment that facilitates the integration of tools developed by other software organizations. Neither CASEdge nor Softbench was designed only for Ada, but developers of Ada tools have found it hospitable.

CASEdge is not a tool. It is better defined as HP's Computer Assisted Software Engineering Program. HP states its CASEdge-objective "to help our customers become more competitive and profitable by providing solutions which significantly improve the predictability and productivity of the software engineering process." The objective also includes a commitment to the quality and maintainability of software.

HP presents CASEdge as a pyramid, with HP and Apollo at the base. Enough said about the base. The **[BY RICHARD RIEHLE]**

next level is knowledge, followed by technology, and topped off by solutions.

From HP's standpoint, knowledge includes seminars, software engineering audits, consultation and training. All of the vendors mentioned can provide these — in abundance — for a hefty fee. HP does publish a handy booklet, CASEdge/Knowledge, that describes this component and includes a detailed discussion of software engineering productivity.

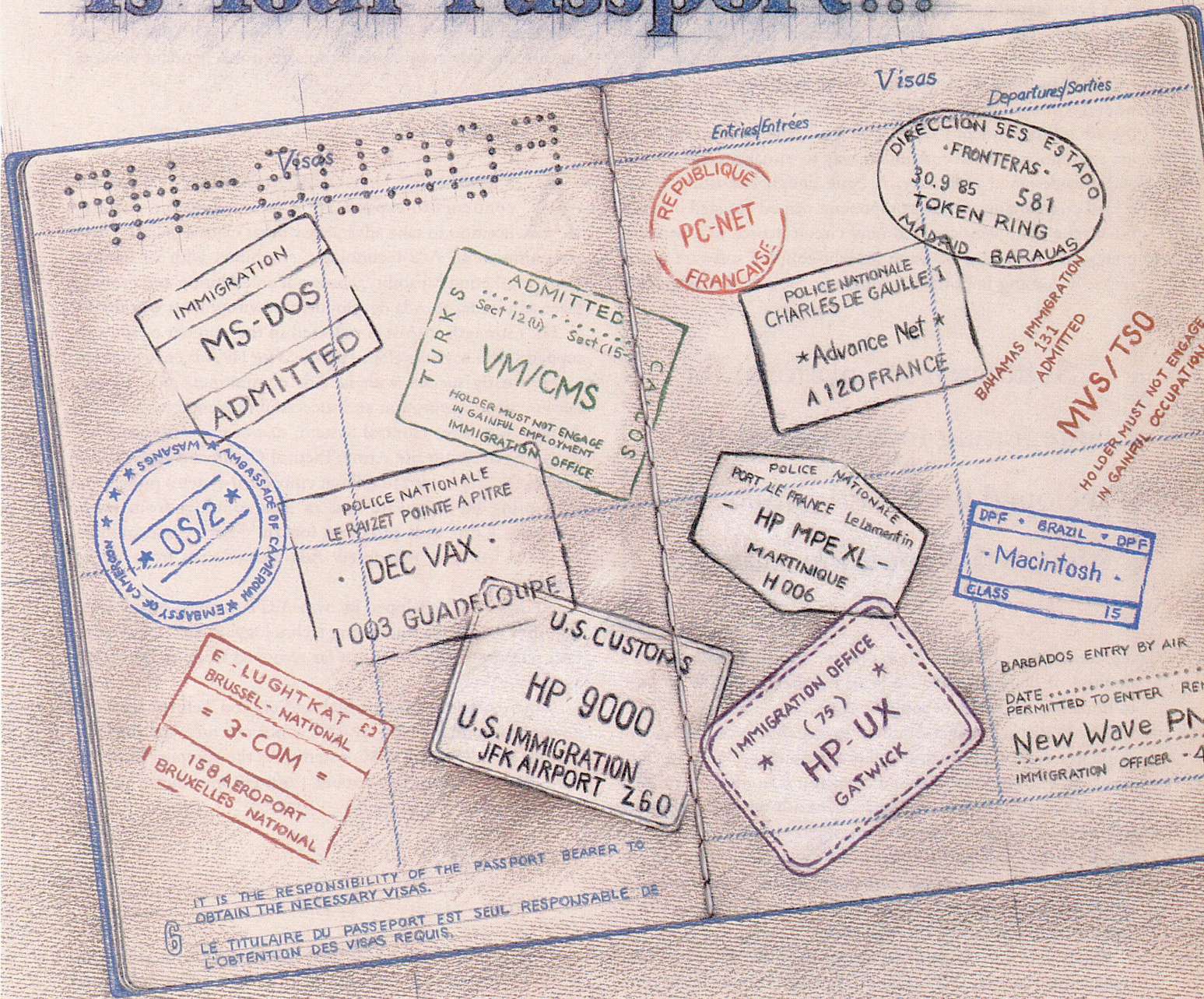
Technology, the next level in the CASEdge pyramid includes Softbench.

Like CASEdge, Softbench was not designed exclusively for Ada. Rather, it covers the entire range of languages supported under HP-UX.

Softbench is currently in release 1.0. It supports the MIT X Windows interface and includes an editor, program builder, debugger and a static analyzer. For improved quality assurance, HP also can provide a coverage analyzer, referred to in HP jargon as a "branch basis" analyzer. Branch analysis means that one way to test a program is to make sure that every possible "branch" is taken and the results of that branch are analyzed and reported. There are also Ada coverage analyzers for Softbench available from other vendors.



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As mentioned earlier, Softbench is not exclusively designed for Ada. In fact, in some of HP's literature about Softbench, Ada isn't even mentioned. Softbench is actually generalized enough that any developer's tools can be integrated into it. This is usually accomplished using an HP product called Encapsulator.

You can think of Softbench design as analogous to object-oriented design. In this context, Softbench is a platform for integrating independently developed tools, and connecting them via a common interface. Another way to visualize Softbench is as a bus-designed computer. A basic design consisting of essential components. Other components can be plugged into the bus in the same way you add new circuit boards to a personal computer. This idea of using loosely-coupled software modules is becoming important throughout the software engineer-

Softbench is a platform for integrating independently developed tools, and connecting them via a common interface.

ing community. It's sometimes referred to as the "software IC" method of design. Softbench is an excellent example of how to implement the idea of software ICs.

The Softbench object-oriented approach also can be understood in terms of object-oriented programming (OOP). In OOP an object encapsulates all the information it needs to perform a task. When Object A needs the services of Object B, Object A sends a message (also defined as an object) to Object B. Resolution of the message by Object B is dynamic. Object B behaves differently depending on the content and structure of the message (polymorphism). Softbench supports this level of integration via the broadcast message server.

Fundamental to the modular design of Softbench is the Tool Integration Platform (TIP). The TIP functions in much the same way as the hardware bus. All of the (software) slots are connected to it, and any new tool will communicate with Softbench facilities via the TIP. In addition to providing the communication path for the tools, TIP also provides a common user interface and an integrated HELP facility. Tools may be either tightly integrated or communicate with Softbench via the "broadcast communication facility" (Broadcast Message Server).

HP has tried to recognize the importance of opening Softbench to other tools, and introduced a product called the Encapsulator.

Once a vendor's software engineering tool has been proc-

essed through the Encapsulator, it can be used seamlessly as part of the Softbench Environment. It was very clever of HP to design a CASEdge product this way. The open architecture of Softbench allows the HP customer to buy SOFTBENCH and acquire any other appropriate tools from independent vendors.

## Ada Tool Vendor Commitment

AS THE INTERNATIONAL MARKETPLACE for Ada continues to expand, HP is in a unique and powerful position to take advantage of that expansion. HP's early commitment to Ada technology, combined with its international marketing capability, ensures it an enduring and growing place as a leader in Ada development environments worldwide.

HP's strength in Ada is reflected in the number of software suppliers who have developed products for HP Ada environments.

HP's early success with its Ada commitment was, in part, because of its acquisition and successful implementation of the Army's Maneuver Control System, one of five automated systems that make up the Army Tactical Command and Control System (ACCS). This \$16 million embedded-systems project was built using HP hardware and an Ada compiler from Irvine Compiler Corp. Ada programs for the other system modules of ACCS will also include HP Ada technologies from Verdix and Alslys.

HP has even developed its own Ada compiler, Ada 300, using Alslys Ada as the underlying technology. In fact, for all practical purposes, Ada 300 is not far removed from its immediate ancestor, Alslys.

Other compiler vendors such as TLD and Telesoft have also developed compilers for HP-UX. Until recently, the only option for HP's 9000/800 RISC systems was the compiler from Irvine Compiler Corp. In October 1989, HP introduced its own 9000/800-based Ada compiler.

## CASE

COMPUTER-ASSISTED SOFTWARE engineering (CASE) has become one of the latest in a long procession of "silver bullet" alternatives. Unfortunately, software engineers are once more discovering that there are no silver bullets. Moreover, the computer-assisted part of CASE often gives the designer the illusion that he is doing the software engineering. You must understand software engineering goals, principles and methods before proliferating diagrams and connecting arrows on a computer screen. Used properly and with a good understanding of the software design and construction process, CASE can be a valuable asset to productive development of reliable, efficient, and maintainable software systems, in any language.





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**CIRCLE 240 ON READER CARD**



The "front-loading" of Ada projects makes CASE a beneficial approach to Ada applications development.

There are more than 100 vendors of CASE tools. Because the focus is on Ada, we can narrow the discussion to four vendors.

### Cadre's Teamwork/Ada

CADRE'S TEAMWORK/ADA was once listed as an HP product but, HP has pulled back from providing Cadre such an exclusive position. Instead, HP introduced "hooks" into the Softbench product to make it possible for a greater variety of third-party tool developers to integrate their products into the HP Ada development environment. Cadre was one of the first CASE tool vendors to take advantage of this connectivity into Softbench. Cadre has maintained its position with HP, though it's no longer listed as an HP product.

Cadre's Teamwork/Ada takes the Encapsulator approach to integration into HP Softbench. However, Teamwork/Ada still maintains the integrity of its non-softbench design. In addition, Teamwork/Ada uses the widely-known (in the Ada community) Buhr notation, described in Ray Buhr's book *Software Design With Ada*. This feature makes Teamwork/Ada an attractive alternative for many experienced Ada application designers.

Teamwork/Ada offers the software engineer with a complete development tool from design through source code. In addition to the usual fancy windowing features found in most CASE tools, Cadre provides cross-window editing. A window can be thought of as a "view," and changes made in one view will be automatically reflected on corresponding items in other views. This feature is possible because of the Teamwork Project Database (TPD) that includes information for all stages of project development.

The Teamwork Project Database also supports requirements traceability, and this is essential for anyone trying to develop a software system under the rigorous guidelines of MIL-STD-2167A. TPD also provides a history of project models, including any notes or code changes. This effectively supports the ongoing configuration management and quality assurance process required by any large project.

### Software Through Pictures

SOFTWARE THROUGH PICTURES (STP) from Interactive Development Environments (IDE), is an interactive, graphical editing environment that permits the design of large software applications. Like Teamwork, it's a complete development tool.

STP is implemented using the "broadcast message server" approach to Softbench integration. By using this object-oriented method, STP takes advantage of those Softbench tools that are necessary; other features such as the Softbench screen format-

ting and windows are bypassed in favor of the native STP windowing user interface. In addition, STP is designed as a CASE engine, and may be driven by the unique options defined by the applications developer. In some ways, STP is analogous to the Expert System model of an "inference engine" and "knowledge base," where the user can modify the knowledge base. Of course, it requires a rather sophisticated user to develop his "own" knowledge base. The typical applications-oriented STP client uses the default knowledge base and symbol tables provided by IDE.

STP has an impressive integration to Softbench. In addition, its Ada development tool is well designed and easy to learn. To date, the STP Ada tools for Softbench have not been released for production. According to IDE sources, product release for the Ada editor integrated into Softbench is scheduled for late summer, and will be a competitor in the Softbench environment for Ada applications development.

Software through Pictures uses Object-Oriented Structured Design (OOSD) rather than Buhr Diagrams, but has many of the virtues of Teamwork/Ada. There's more of a Booch-flavor (after Grady Booch of RATIONAL in Santa Clara, CA) to the STP product, but STP also supports other notations, including Jackson System Development (JSD) and Chen's Entity-Relationship approach to modeling.

Like Teamwork, STP also has correct support for Ada task models. And STP provides support for information hiding, generics, private and limited private types. Both STP and Teamwork/Ada are easy to learn if you already know something about Ada and the design method being supported. Neither tool can be used without some familiarity of Ada.

### KeyOne

KeyOne from LPS is a newcomer to the Ada CASE tool marketplace with explicit support for HP-UX. In fact, someone could argue that KeyOne is not an authentic CASE tool because it does not include all of the graphical gymnastics available from the other three vendors. In my opinion, for many situations, a CASE tool can be simply a good language sensitive program editor.

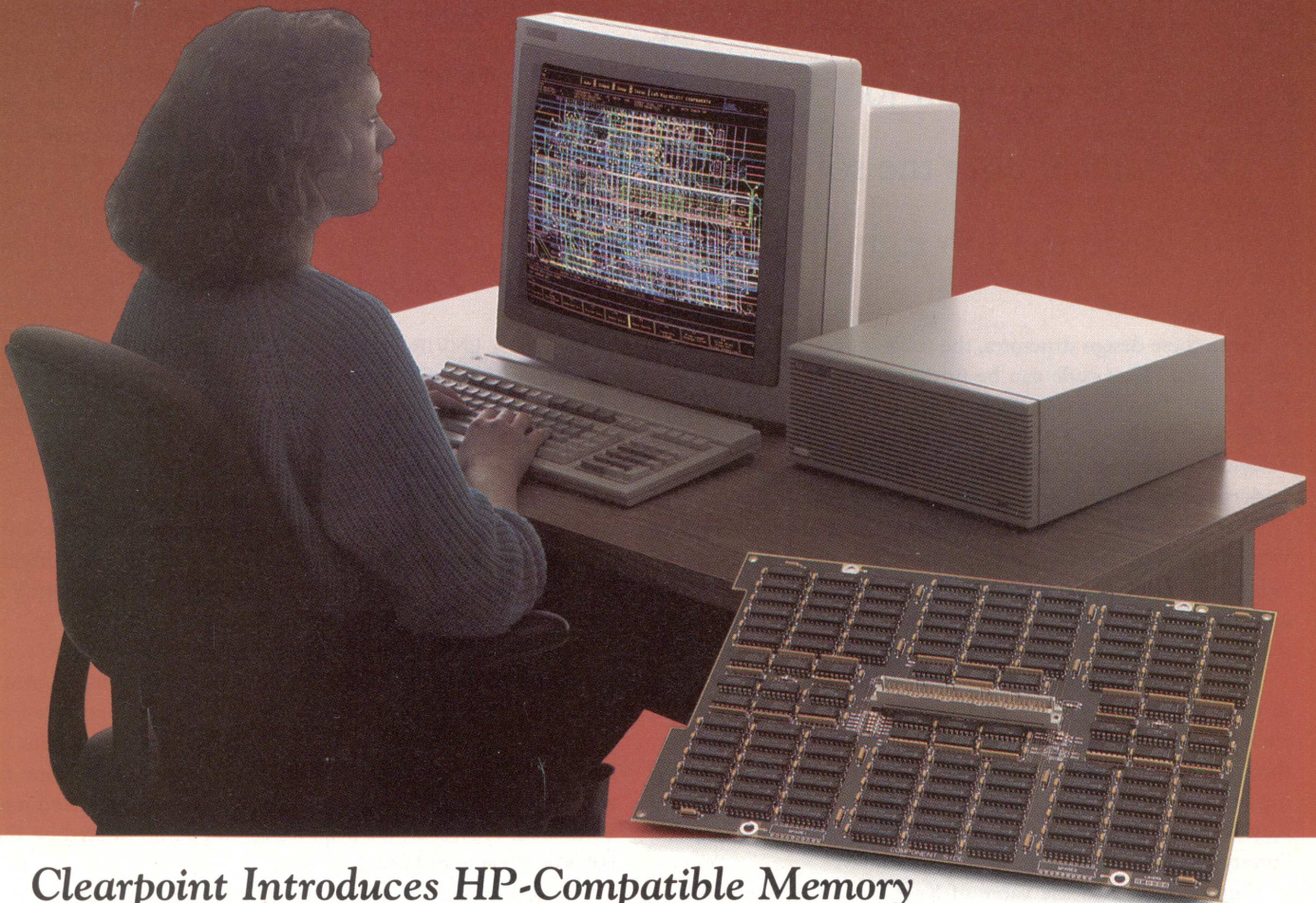
KeyOne is one such editor and more. Also, it can be used with the other CASE tools discussed.

As a total product it divides the development process into three functions: a syntax editor, a text editor and documentation support. The syntax editor and text editor are fully integrated and one can navigate between them easily.

The syntax editor may be used as an Ada Program Design Language (PDL) tool. It supports a concept that LPS calls "hypertext," which permits high-level design statements to be expanded into more detailed design structures. This is reminiscent of traditional "stepwise refinement" used in top-down design methods.



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*Validation: does the software  
do the right job?*

*Verification: does the software  
do the job right?*

From these design structures, the programmer can derive Ada source code. That code can be further edited by the text editor facility. This is an excellent approach to designing into Ada at the highest level of abstraction. Such abstractions free the designer/programmer from focusing on semantic issues before understanding the behavior of functional relationships.

The syntax-directed editor also can be useful in environments where the programmers are unfamiliar with the fine points of Ada code. KeyOne achieves this through the use of an Ada language template. Consequently, the editor can ensure correct syntax. It cannot ensure correct code.

Part of KeyOne is the KeyDoc facility. KeyDoc can be used in parallel with other KeyOne features. When it's run in parallel, the Verification and Validation personnel can trace the threads of control, and make certain that the project is proceeding according to original design. At the end of the project, KeyDoc can produce a full set of documentation using its "pretty printer" feature.

One testimony to the value of KeyOne is the recent decision by Verdex to include the syntax-directed editor, under the name KeyFlex, with VADS (Verdex Ada Development Environment).

It's likely that KeyOne products could be a good supplement to the more powerful graphical CASE tools we have already described. Certainly, KeyOne is compatible with the fundamental ideas of modularity built into HP Softbench.

### Adagen

**A**NOTHER ADA CASE TOOL available on HP-UX is Adagen from Mark V Systems in Encino, CA, a company that has taken a slightly different approach with its CASE tool. Of immediate importance is its sole emphasis on Ada. Adagen has its future firmly rooted in the success of Ada or its look-alike successor.

Adagen supports a wide range of design methods, including OOSD, Buhr Diagrams, data-structure-oriented design and data-flow-oriented design. It also supports state transition diagrams (useful for embedded real-time systems) and Chen's E-R mod-

eling. Adagen permits top-down design strategies, or bottom-up design. It automatically generates code when design is done using Buhr Diagrams. A nice feature of Adagen is its ability to produce diagrams from Ada source code. MARK V refers to this as "reverse engineering." This can be very useful in software maintenance. The diagrams produced by this process are also in Buhr notation. Adagen is expected to be integrated into Softbench this month.

### Validation/Verification

**A**DA ENVIRONMENTS LEND themselves to a wide variety of development and measurement tools. Also, Ada requires the same verification and validation (V & V) efforts found in other software projects.

*Validation: does the software do the right job;*

*Verification: does the software do the job right.*

Also, Ada's package feature provides an opportunity for software developers to create generic reusable components libraries. A frequently overlooked aspect of software engineering is software metrics.

Logiscope is another coverage analysis product available on the HP is marketed by American Management Systems Inc. AMS demonstrated Logiscope at the 1989 Fall Tri-Ada conference, and it appears to be a very good candidate as a component of the software validation and verification process. Logiscope is, at this time, a standalone tool, and is not directly integrated into Softbench. However, it's been tested and demonstrated on the HP 9000/300 under HP-UX.

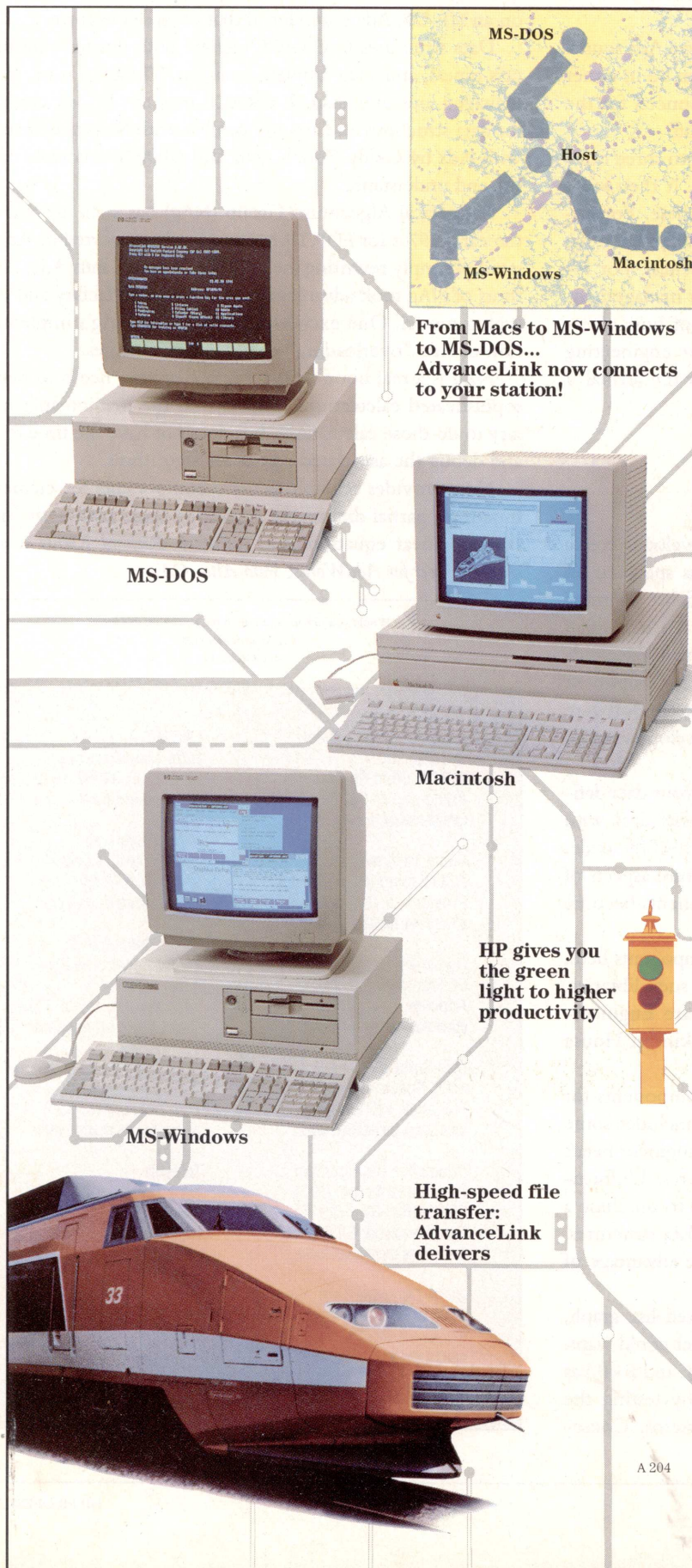
Logiscope takes the analysis a little further and introduces a set of tools for software metrics. It divides the analysis process into Static and Dynamic. Static analysis evaluates code complexity, and reports on Ada programming practices. This report includes 24 different metrics in terms of code size and structures. Results are reported in either tabular or graph format, and can include visual representations of logic sequences. Interestingly, this capability includes Ada exceptions.

Logiscope's dynamic analysis can be used for unit testing and integration testing. This also is useful for verification and validation. In fact, for an organization using Deutch's "Thread Build Plan" method of V & V, Logiscope can be quite beneficial. Dynamic analysis reports on tested and untested paths (branches) in the code. In addition, with Logiscope V & V personnel can construct tests to exercise every path in the program.

Logiscope is not a graphical CASE tool. To use it some source code must exist. However, it can be used throughout the project life cycle for documentation and "build plan" management. As of May, Logiscope is not Encapsulated into Softbench, but American Management Systems, the U.S. distributor for this French developed product, expects to complete encapsulation this summer.



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Dynamics Research (Andover, MA) has another tool for Ada metrics named AdaMat.

AdaMat uses over 150 software metrics to analyze Ada source code. As with Logiscope, the resulting reports can be in either tabular or graphical format. AdaMat is not announced for the HP-UX environment, but this should not be far off.

AdaMat divides Ada source code evaluation into three categories: reliability, maintainability and portability. It then scans the code and reports on the extent of each of these. For example, maintainability is measured by looking at the code for modularity, simplicity, clarity and self-descriptiveness. For reliability, AdaMat uses a technique called anomaly management.

AdaMat and Logiscope can perform analysis of how effectively the coded program measures up to software engineering principles. They cannot be used as substitutes for the formal V & V process.

## Generic Components

**A**DA'S CAPABILITY FOR LETTING a developer create or use generic reusable components has spawned an industry of small corporations that specialize in reusable software. A generic component in Ada has the benefit of providing the solution to a complex set of algorithms independent of Ada's requirement for strong typing. Each component can be implemented for a specific data type, but the software application designer of software can ignore the development and testing of a underlying algorithm.

The idea is, use my reusable algorithm(s) with your data definitions. You can let the developer of components deal with the headaches associated with the procedural aspect of the code. This is going to be one of the most beneficial future aspects of Ada as more of these libraries of reusable components become available.

We mention only two libraries of reusable components here, but there are many software companies creating such libraries. The two companies mentioned are EVB Software Engineering's GRACE components, and NAg, from Wilkinson House (Oxford, England).

GRACE stands for Generic Reusable Ada Components for Engineering. The entire library of components includes some 275 units of code. To use GRACE, the software engineer needs to understand the fundamentals of data structures. Unfortunately, the people who are making the decisions to purchase a tool like GRACE often lack the knowledge of data structures. Consequently, there is widespread failure to take advantage of the opportunity for such component libraries.

GRACE includes nearly every variation of linked-list, graph, tree, and stack that any reasonable software designer could want. All of the components are coded in standard Ada, and EVB has attempted to eliminate platform dependencies by testing the components on a wide variety of computer systems. Conse-

quently, there is no need for independent validation of GRACE on an HP-UX Ada compiler, if that compiler is correct.

Data structures in GRACE include both dynamic (using access types), and static implementations. These, in turn, may be managed and unmanaged. GRACE uses the Booch taxonomy for data structures and anyone familiar with Software Structures with Ada by Grady Booch, will find GRACE relatively easy to use and understand.

Numerical Algorithms Group (NAG) has been around since the early 1970s for FORTRAN and has been ported to Ada. Instead of simply rewriting the FORTRAN code into Ada, the authors of NAG took advantage of Ada's generic facility and strong typing model. One excellent decision was NAG's implementation of Ada "overloading" of subprogram names.

NAG is a real boon to the developer who needs to perform sophisticated calculations, understands the mathematics necessary to do those calculations, but does not have the time to code and debug the associated computer algorithms.

NAG provides reusable generic components for elementary functions, partial differential equations, basic arithmetic, simultaneous linear equations and more. —Richard Riehle is a software engineer for AdaWorks, Palo Alto, CA.

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# MULTIVENDOR LANs

## Designing And Managing A System That Works

Local area networks (LANs) are one of the most rapidly changing fields within the data communications arena. Announcements of new products are a daily event, with players in the LAN market coming and going just as quickly.

How can diverse local area network technologies be molded into one network supporting multiple communication protocols and common software applications? What are the advantages in creating this kind of environment? And, what are some problems that can be overcome?

Let's review an example of how LANs are constructed (see *Figure 1*). *Figure 1* shows a HP OfficeShare PC network composed of HP 3000 minicomputers and IBM-compatible PCs. OfficeShare is a collection of products allowing the HP 3000 to function as a server on a LAN. Because of the requirement for a particular software package, another department within the company has a Novell NetWare LAN. The Novell users would like to run applications on the HP 3000 computers and transfer files between the PCs and the HP 3000. Also, software applications on the PCs must communicate in a program-to-program environment with applications on the HP 3000.

In order for the Novell PC users to communicate as remote terminals over the Novell NetWare LAN to the HP OfficeShare LAN, the following is required:

- The Novell PCs in the network must run a terminal emulation software program such as HP AdvanceLink. This would be in lieu of other Novell user applications.
- Physically connect the two LANs with a PC gateway running a protocol translation program. This is required because the NetWare and OfficeShare LANs use different network communication protocols (see *Figure 4*). This gateway PC also must be configured with both Novell and HP LAN cards.

In order for the PC users to transfer files to the HP 3000, the terminal emulation software HP

AdvanceLink would be used. This file transfer application must be running on the Novell PC and the HP 3000. A PC gateway still would be necessary. *Figure 1* shows this.

In general, other terminal emulation software packages could be used instead of HP AdvanceLink. For example, the de facto industry standards TEletypewriter NETwork protocol (TELNET) could be used for terminal emulation, and File Transfer Protocol (FTP) for file transfers. As with HP AdvanceLink, both TELNET and FTP would have to be installed on the PC and the HP 3000.

TELNET doesn't support all terminal protocols, such as DEC VT-240 or full-screen HP block mode. Character-mode applications will run using either TELNET or AdvanceLink; full-screen applications require HP AdvanceLink. Both TELNET and FTP are part of a set of software services called Advanced Research Project Association (ARPA) — an organization within the U.S. Department of Defense.

## Technology

The software technology making it possible to connect different LANs is the communications model developed by the International Standards Organization (ISO). The ISO is an organization within the United Nations with the charter to develop and promote worldwide communication standards.

The model is called the Open System Interconnect (OSI) model. It's a software methodology that provides communication between computer systems of hardware manufacturers who implement the model. *Figure 2* shows this seven-layer OSI model. Within the definition of the seven-layer OSI model:

- Any given layer communicates or passes data to adjacent layers.
- The same layers on different computers in the network communicate.

For example, layer 2, the Data Link layer, sends and receives data to and from layers 1 and 3.



## LAN

Robert S. Yori



And, layer 2 on one computer communicates with layer 2 on another computer. One example of this is the error correction algorithm performed by layer 2 — the Cyclical Redundancy Check (CRC). Layer 2 on the sending computer receives confirmation from layer 2 on the receiving computer that the packet either was received correctly or that retransmission is required.

Within the OSI model structure, the task of moving information from one computer across a communication network to another computer is subdivided into seven tasks or layers. At each layer, the OSI model defines the specific activities performed, plus the rules for communicating with adjacent layers. Each layer is a separate set of rules, in effect a separate protocol, making it possible for different computer systems, PCs or desktop workstations to communicate, regardless of the operating system used by each computer. The seven layers together are called a protocol stack.

Given that one particular layer of the OSI model interacts with only adjacent layers, the theory behind the OSI model states that layers are "removable." This feature makes possible, for example, the substitution of software and hardware running coax LAN communication (layers 1 and 2) to be replaced by that running LAN communication over unshielded twisted pair wiring, without affecting layers 3 through 7. Thus, communication protocols can be easily adapted for various vendor and communication environments.

Even though all layers are "removable" within the OSI model, certain layers work more closely with each other. These closely coupled layers are: Layers 6-7, 3-4 and 1-2 (see *Figure 3*).

One example of this is the interaction between layer 3, the network layer, and layer 4, the transport layer. Layer 3 routes packets through the network. Layer 4 ensures that all packets have arrived and are sent to the upper layers in the correct sequence. Consider the situation where the user data being sent through the network won't fit into one packet. There's a possibility that the packets may arrive at the receiving end in a different order. This

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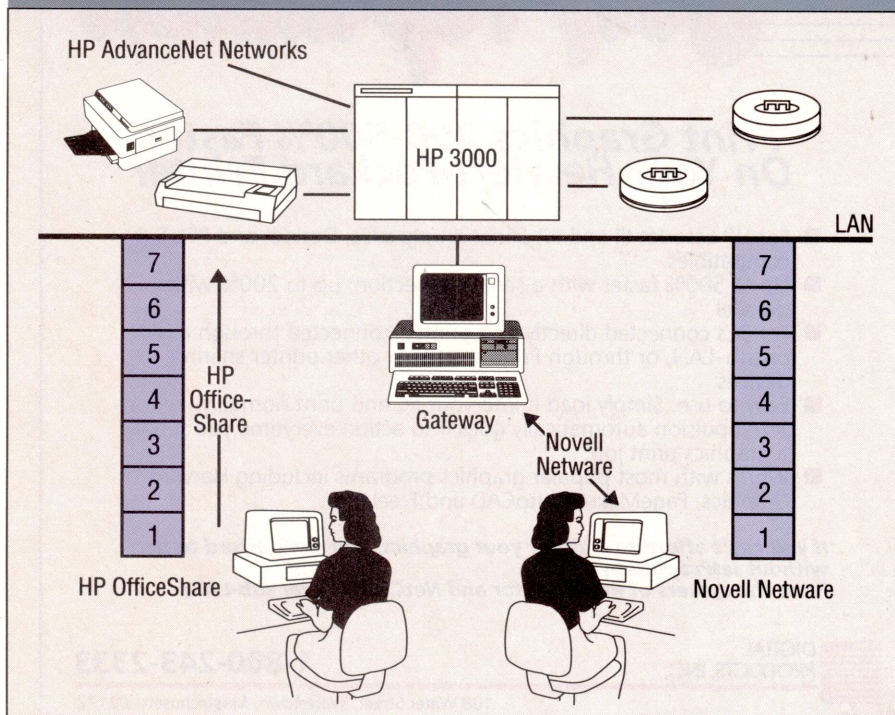
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# FIGURE 1.



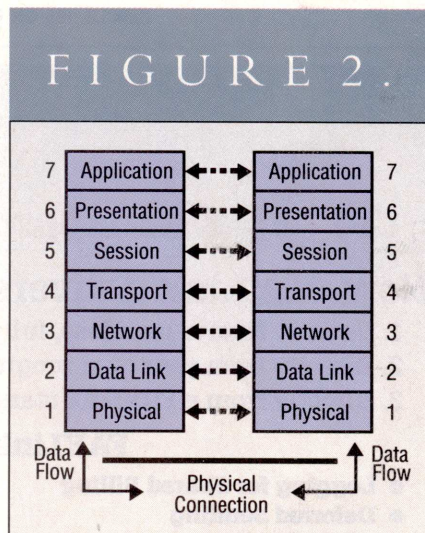
HP AdvanceNet Networks.

can happen when the retransmission of packets is required, based upon layer 2 CRC checking, or when alternate routing paths are used, based on layer 3 routing algorithms. Layer 3 will pass the packets to layer 4 in the order received. Layer 4 sequences them correctly before passing the user data to layer 5.

Layer 5 is a pivotal layer, connecting the application interface layers 6 and 7, with the transport and network layers 3 and 4 (see Figure 3). Examples of protocols used at layer 5 include NetBIOS, developed by Sytek for IBM, and NetIPC, developed by HP. Layer 5 is a set of application program interfaces (APIs) or subroutines that are programmatically callable from the user application.

In all instances, layer 6 must know which protocol is being used at layer 5. If an application is to run on protocol stacks supporting either NetBIOS or NetIPC, then either there must be two versions, or both interfaces must be designed into the same version.

Also, situations occur where LANs using different protocol stacks must com-



OSI 7-layer model.

municate. For example, a PC on an HP Officeshare network may need to share files with a PC on an IBM token ring network. This may be necessary when users select software packages that run only on one particular PC LAN. In this case, a gateway can be used to translate the seven layers of one OSI protocol stack into the seven layers of another OSI

protocol stack. This gateway can be a PC running special software, or a hardware device built specifically to handle the translation. In either case, the gateway must be configured with LAN interface cards for both networks. The software running on the gateway must translate one LAN's protocol stack into another LAN's protocol stack. In effect, the gateway supports dual protocol stacks. Figure 1 represents the functioning of the gateway, referred to in the first example. DEC's SNA gateway is another example, translating a DECnet protocol stack into an IBM SNA protocol stack.

The feature of layer removability within the OSI model makes the construction and maintenance of a multivendor LAN running a common user application possible. This feature gives the network designer several options.

- Match all seven layers of the protocol stacks on all computers. This may be the most difficult to do, especially in a large network, because no single computer manufacturer makes all the software and hardware that may be needed by all users.
- Match layers 3 through 7 and use bridges to translate the layer 1 and 2 protocols. This is done in situations where network software is supported on different physical networks (i.e., Novell).
- Design the network so that different LANs, running on different protocol stacks, communicate by way of gateways.

## HP Novell Gateway

Let's look at the design of the HP Novell Gateway product. As discussed earlier, this is a PC-based gateway, translating a Novell protocol stack to an HP Officeshare protocol stack. This allows HP Officeshare software to run on the PCs with a Novell protocol stack, while preserving all the features of the HP Officeshare PC software. This feature set includes:

- Terminal emulation and file transfer via AdvanceLink.
- Program-to-program communication via NetIPC.
- "Cooperative Services" allowing the HP 3000 to function as a PC server on the LAN.

Figure 4 shows a comparison between



a Novell protocol stack, an HP Office-share protocol stack, and the OSI model. Note that the Novell and HP stacks are different at each of the seven layers. The Novell stack is running on an 802.5 IBM token ring (TRN) physical network. Novell networks operate on physical networks other than TRN, such as Ethernet, 802.3 and ArcNet. The HP Novell Gateway supports all of these interfaces. Here, the TRN interface is used.

Figure 5 shows the relationships between the HP and Novell protocol stacks as packets move from the PC through the gateway to the HP 3000. The common portion of the packet that is transmitted through the network is shaded.

**User PC:** Here, the upper five layers of the HP Officeshare protocol stack (layers 7 - 3) are passed to NetBios. These upper five layers are passed, via the NetBios SEND command, as a block of user data. At this point, NetBios then passes this "data" to the Novell transport and network layers (layers 4 and 3), and then onto the network through the TRN card.

**HP Novell Gateway:** The gateway receives a packet from the user PC through its TRN card. This packet is sent through the Novell protocol stack within the gateway. At layer 5, NetBios passes the block of "data," which originated in the user PC, to the HP gateway software. This software links the "data" into the HP Officeshare protocol stack on top of layer 2. This is possible because the "data" from the user PC is really the upper five layers of the Officeshare stack. The packet of information is sent through the 802.3 card in the gateway to the HP 3000.

**HP 3000:** The HP 3000 receives the packet from the gateway and sends it through the Officeshare protocol stack. At this point, the incoming packet looks like any other 802.3 Officeshare packet. The HP Novell Gateway eliminates the need for the HP 3000 to know anything about the Novell LAN.

This scenario describing the flow from the user PC through the gateway to the HP 3000 is reversed when the HP 3000 sends packets back to the PC user.

This design has several key advantages:

- HP Officeshare software that currently runs on 802.3 LANs will run through the

Novell Gateway without modification and without loss of functionality. This is a major savings for HP, software suppliers and users.

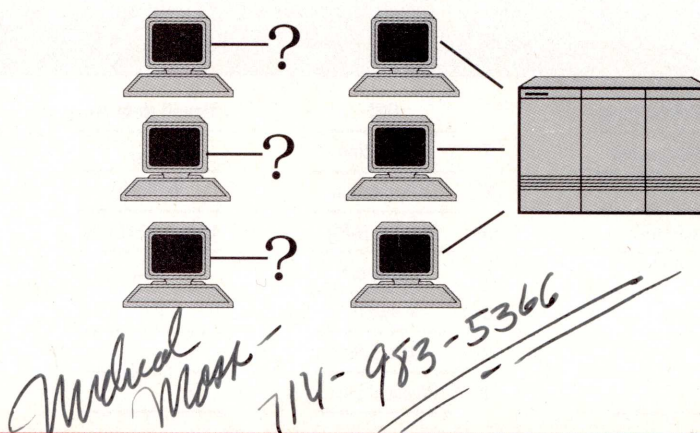
- By bundling the upper five layers of the Officeshare stack on the user PC on top of the Novell stack, the gateway performance is increased. The need for the gateway to add or remove the layer 5, 4, and 3 network information to the user PC

data is eliminated.

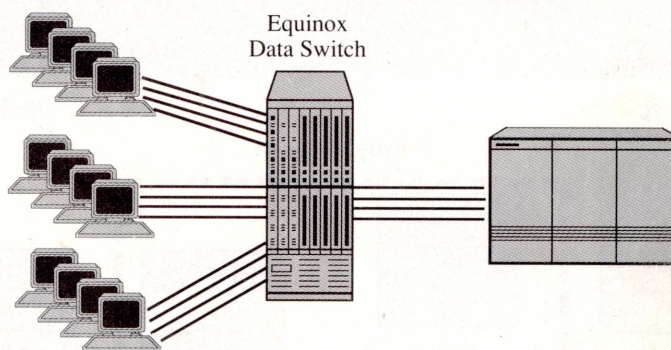
- Minimal software had to be written to implement this gateway solution — only the gateway software and the layer 3 IP-to-NetBios interface on the user PC. No software modifications were required on the HP 3000.

- The ability for PC applications to communicate with HP 3000 applications in a program-to-program environment is

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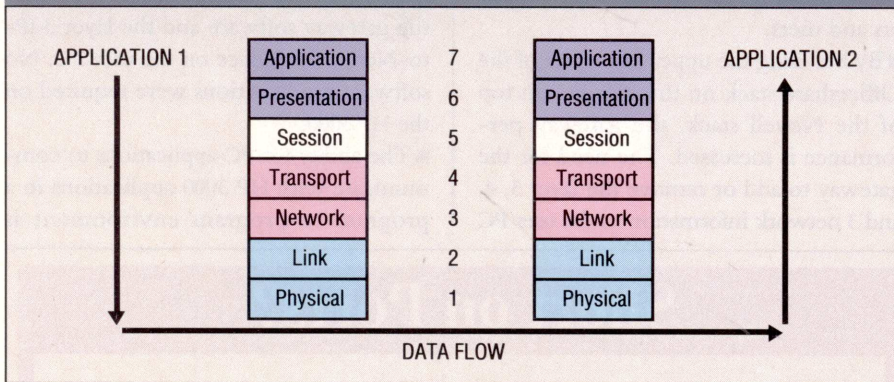
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# FIGURE 3.



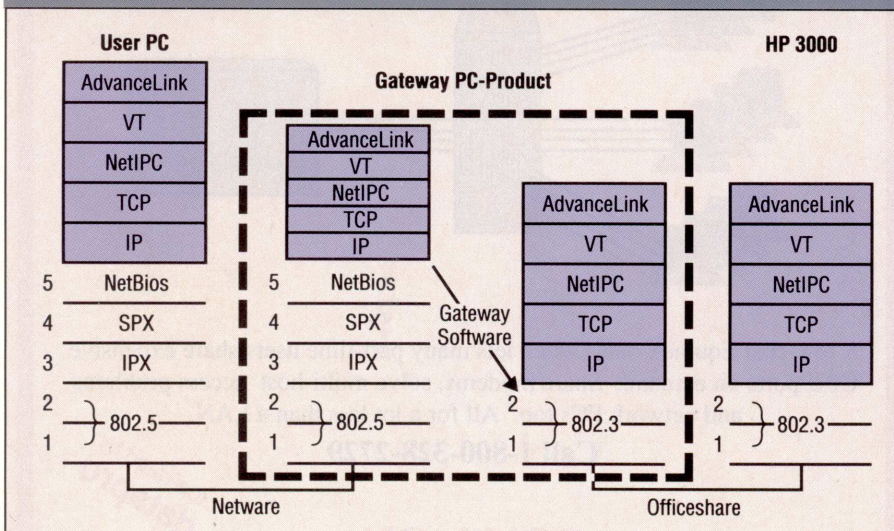
*OSI protocol layers and "layer substitution."*

# FIGURE 4.

HP Officeshare		OSI		Novell Network
AdvanceLink	7	Application		—
VT	6	Presentation		—
NETIPC	5	Session (API)		—
TCP	4	Transport		—
IP	3	Network		—
—	2	Data Link		—
—	1	Physical Link		—

*OSI protocol stack comparisons.*

# FIGURE 5.



*HP Novell gateway protocol stack relationships.*

preserved. This is because the layer 5 NetIPC APIs are part of the common data sent with all the packets in the network (see Figure 5).

As mentioned before, this implementation is independent of the physical LAN card used by the Novell network software. The HP gateway software in the PC gateway only communicates with NetBios. The Novell network software handles the interface to all the network cards supported by Novell.

## Design Suggestions

When software and hardware components are supplied by various companies, it may be difficult to ensure the interoperability of these components. To avoid these problems, choose network components that conform to international standards, specifically the OSI communications model. Testing is still required though. This is one of the charters of the Corporation of Open Systems (COS) — to test selected software for conformance to the OSI standards. Software not already tested for interoperability must be tested by the designer of the network.

When designing networks, one common misconception is that Ethernet and 802.3 are the same, because many times the terms are used interchangeably. In reality, the 802.3 standard grew out of the Ethernet definitions defined by Xerox Corp. Both protocols use the same physical cabling, but the format of the data packets sent over the communication network isn't the same. The difference is in the format of the data packet after the destination and source addresses. The result is that systems talking Ethernet and 802.3 can use the same cabling, but can't talk to each other. Packet conversion is required for Ethernet and 802.3 systems to communicate. Two companies that make hardware and software products that perform this conversion are The Wollongong Group (Palo Alto, CA) and Cisco Systems (Menlo Park, CA).

Also, assume the network will need to accommodate different communication protocols, along with various application packages. These abilities will be inherent within the network if protocols and applications that conform to the OSI



standards are specified. As the designer, you will be able to take advantage of the concept of layer removability to install applications throughout the network, using whatever communication protocol is appropriate within a department or work group.

Finally, the best way to control LAN performance is to isolate departmental data traffic from the main LAN backbone. This is accomplished using a device called a "router," or IP router. A router manages the flow of packets through the network by reading the layer 3 IP address, hence the term IP router. If the address is for a device on the departmental LAN, the packet never gets sent onto the backbone, thereby isolating the departmental traffic and increasing the performance of the entire network. A gateway can perform the same functions as a router, but the gateway reads all seven layers of a protocol stack, where a router reads only the first three layers.

Because gateways and routers can perform the same tasks at layers 1 through 3, don't assume that a gateway always should be used instead of a router. Routers are usually hardware devices designed for a particular task, many times with the layer 1 through 3 software implemented in read-only memory (ROM). Gateways are usually PCs or minicomputers that run software that translates all seven layers of a protocol stack. Therefore, gateways will tend to be more expensive than routers. Plus, gateways are slower, because their software applications aren't ROM-based and they must translate seven layers of protocol.

## Network Management

Network management is one aspect of network design that is overlooked more often than not during the network planning phase. When planning a multivendor network, the ability to effectively manage the network and its components should be designed into the network before any vendor is selected or equipment is purchased.

Network management implies different capabilities to different designers. In its basic form, network management provides for the detection of component

failures in the network. The emerging concepts of network management provide for the management of the PCs and computer systems on the network. This includes monitoring the performance of the network and the computers.

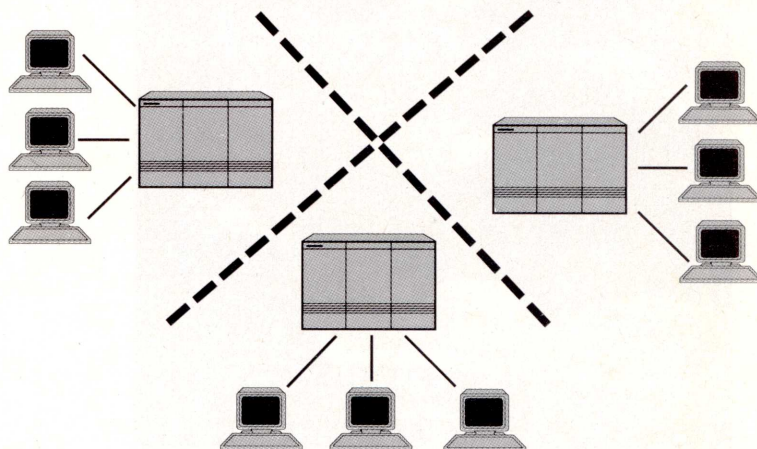
The emerging OSI standards define software procedures for managing networks from the perspective of:

■ Determining sources of failure.

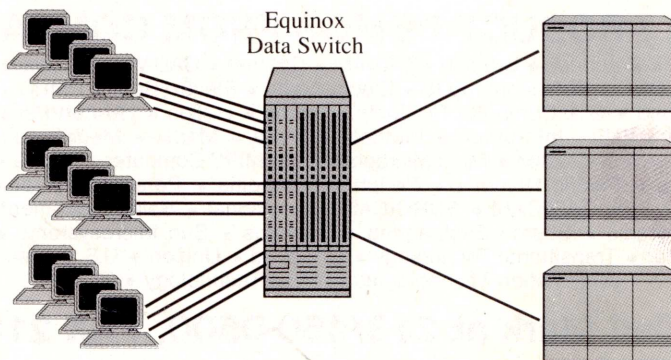
- Tracking network and system performance.
- Device inventory management.
- Security.

On the TCP/IP platform (layers 3 and 4), one de facto standard is Simple Network Management Protocol (SNMP). For the OSI platform, the network management scheme emerging is Common Management Interface Protocol (CMIP).

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One of the advantages of CMIP over SNMP is that CMIP provides for network security.

When designing a network on the TCP/IP platform, specify that the network management software not only use SNMP now, but that the vendor will migrate the software to the CMIP standards.

## Standards

We have discussed techniques that can be used to create an environment where multivendor LANs not only communicate, but support common applications. One technique is to use gateways to translate different network protocols.

One advantage of designing a multivendor network based on the OSI model is that a common user software interface can be used on all the computers and PCs in the network (e.g., HP AdvanceLink). This use of a common application interface on all computers will ensure that users can operate any of the computers in the network, regardless of their operating system. The network designer is free to choose the technology best suited for a particular segment of the network. The network truly can be designed for both the convenience of the user and the flexibility and performance needed by the network designer.

By using LAN hardware and software components based on OSI, software applications can be purchased from various suppliers. Purchase criteria should depend on whether the application can communicate with the layer 5 protocol being used in the network. This gives users not only a larger choice of software products, but provides the network designer and corporation economic flexibility. Companies now have the ability to purchase applications for the network, and network hardware components, from vendors other than the original supplier.

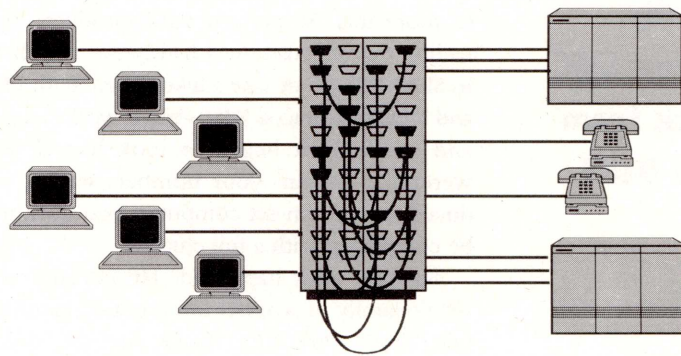
Another advantage of specifying conformance to OSI standards is that, in the near future, network management will be a part of that standard. This will allow centralized management of a multivendor network. The network manager can determine the operational state of all components, including performance.

The OSI standards provide economies of scale for the designer, the user and the

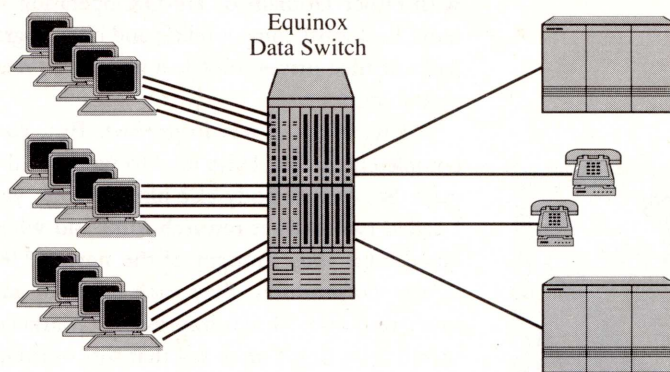
corporation. As the international standards evolve, the network also can evolve. Adherence to international standards ensures that the network can be maintained, supported and enhanced for many years. —Robert S. Yori is a network consultant for Hewlett-Packard, Dallas, TX.

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# WANTED, DEAD OR ALIVE

## HP's New Workstation Family Brings CISC Back From The Dead

Out there in the wild and woolly world of workstations, folks are fond of saying things like "RISC is the architecture of the '90s!" or "CISC is dead, long live RISC!" or other ebullient words to that effect.

It all started a while back when Sun switched to more than 80 percent RISC products, signalling that its customers had better switch to its SPARC RISC or take a hike. Then, both IBM and DEC introduced RISC-based workstations, and suddenly it began to look like if you weren't crunchin' your numbers with a reduced-instruction-set computer, you must not be computing with a full chip set.

So then what happened? HP introduced a whole family of workstation products based on that "dead" 68000 CISC family. And the "dead" product family from HP offered: Performance up to 26 mips, 4.5 MFLOPS (only IBM's RISC workstation can top it, and not by enough to matter); Price/performance to match or beat any in the market; applications now totalling more than 3,200; hardware that can be ordered with either Domain or HP-UX operating systems; backward compatibility; and clear upgrade paths at nice prices. Not too bad for a "dead" technology.

Okay, okay, I was impressed. But, to be completely honest, I also used to work for these guys. So, did anybody else like it? Well, yeah. I called two market research folks and when I asked what they thought of the new HP 9000 Series 400 products, they each gave the same exact response: "I was impressed." Market research folks don't often say that sort of thing. I thought the fact that they were impressed was impressive.

"If you looked at the new workstation announcements, they were all RISC," says Kathleen Hurley of Dataquest, (San Jose, CA). "The obvious interpretation is that CISC is dead. But the new HP workstations make it clear that HP will continue to support CISC. CISC is not dead."

Hurley called the HP products "competitive in the market," with "impressive price performance" and "impressive graphics." Hurley said that HP's chief competitor, Sun, sells graphics that aren't so impressive. She also said that by offering high-performance solutions based on the 68000 family at a time when Sun is rapidly abandoning its 68000-based products in favor of SPARC, HP has a good chance of capturing a chunk of Sun's homeless 68000 customers.

Another market researcher, Chuck Barney of WorkGroup Technologies, (Hampton, NH), credits HP with a "well-thought-out strategy that takes care of business in a logical progression... protecting their customers' investment in the 68000 platform." Barney calls the Series 400 product line "a very viable platform with competitive performance" that will make staying strong in the market "no problem for HP."

Barney particularly likes HP's merger of the hardware platforms from previous HP and Apollo products (see *Figure 1*). "This is a nice blend of technologies, with an element of synergy that I'm sure HP knew about when they bought Apollo, but people were wondering if they could pull it off."

### Merging Hardware

And HP did pull it off. To put it simply, former HP or Apollo customers now get a single set of hardware that they can use whether they are used to HP-UX or Domain operating systems. That meant making a lot of different hardware play well together.

"Keyboards, I/O backplanes and graphics all were involved," says Tom Rallens, HP's 68000 product line manager. "We had to design a system that would allow applications to come to the new platform from both older systems without requiring recompiling."

HP could have packed both older designs into a single box to get the job done, but the result would have been an overpriced market-

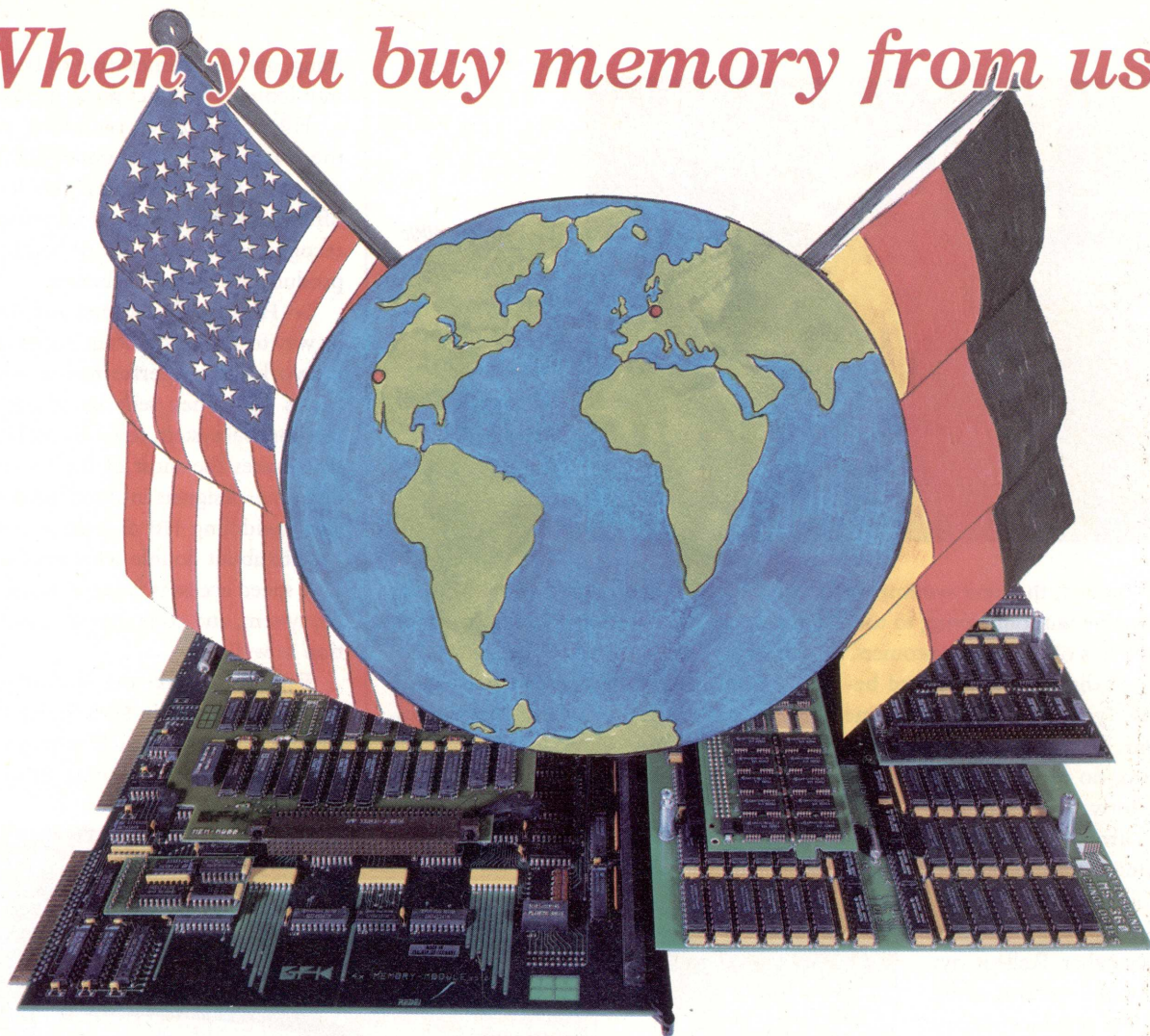


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place loser. Instead, the new systems are fully competitive without having to turn away any of HP's or Apollo's customers.

If you used the Apollo keyboard before, surprise, you still can use the same design. And, if you were fond of the HP keyboard, no problem. Your design has moved forward as well. I/O backplanes from both earlier product families are supported on models in the Series 400 line.

Merging doesn't stop with the hardware either. Rallens says the new graphics systems come with a PHIGS graphics library that is compatible with either HP-UX or Domain versions of the 400 family, and other merged capabilities will follow. "Our strategic direction is to move customers to the OSF/1 operating system in the future, and merge the OS kernels there," he says.

## Performance

So how did HP pull this rabbit out of the hat? Industry watchers were writing off the 68000, but HP's new 68000 line is fully competitive with RISC. What's going on here?

The answer has three parts: HP systems integration, Motorola integrated circuit design, and industry hot air. The hot air part is easy. People saw RISC taking off, got excited and figured

that the 68000 couldn't possibly make similar gains. They were wrong (more on this later).

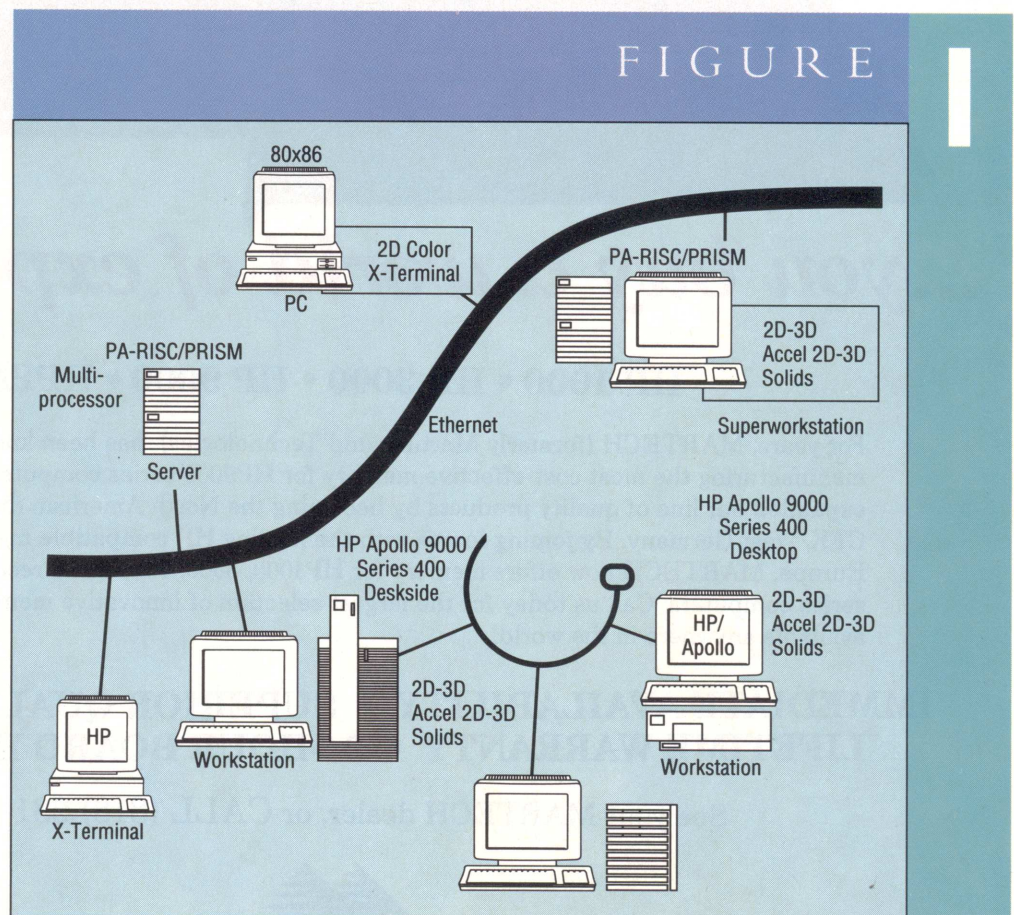
Next, look at HP's systems integration. HP's engineers can't help themselves. These people are compulsive about engineering the last little umph out of every-

thing, and sometimes have to be coerced into letting a product go to market.

HP's compulsive twiddling goes all the way back to co-founder Bill Hewlett, who used to saunter into local HP offices unannounced and sometimes unrecognized to get his fix of fiddling with products on the repair bench.

So HP twiddled, tuned and designed its way to some significant improvements in workstation performance with the Series 400. They redesigned the entire memory subsystem to 64-bit architecture that makes the most of the 68040. HP's disc drive designers in Boise did their part also, twiddling HP disc drive performance to about double what it used to be. Disc speed access is faster, as is the UNIX file system, and compilers received attention as well.

Finally, let's take our hats off to Motorola. The 68030 in HP's Series 400 line runs at 50 MHz, which is pretty neat. That chip delivers 12 mips. Now think



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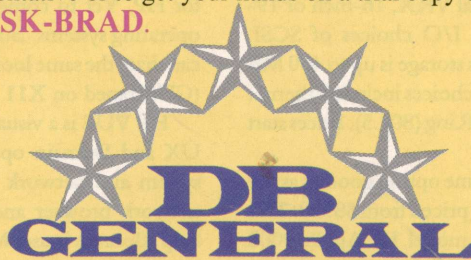
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about this carefully. The slower 68040, running at 25 MHz with its current version, turns out 20 mips in a chip family that was supposed to be over the hill. How did they do that with CISC? This is a trick question, because Motorola didn't make the 68040 with CISC — it made the 68040 with RISC/CISC. Yes, the 68040 makes use of both CISC and RISC technology sneaky.

"There is nothing inherent in RISC that makes it the solution to all computing problems," says Roy Druian, 68000 product manager for Motorola. "It is an implementation. We offer it in our 88000 family ourselves. We have developed techniques that improve the performance of both families. A lot of the work on the 68040 was optimizing the most common instructions in a pipeline to speed

them. We also paralleled the operand instructions and other operations. Many operations were pipelined down to a single cycle. Just as in RISC, we try to make the most common instructions run faster. We didn't get to wipe the instruction set slate clean, but we still see some 70 percent of the instruction set for the 68040 falling into a single cycle."

WorkGroup Technologies' Barney

## [ MERGE SPECIFICATIONS ]

Competing in the workstation market apparently means that products have to come out in huge floods, all at once, inundating the marketplace with new data and overwhelming all but the most stalwart folks. There is a lot of stuff, so hang on tight.

### Merged Hardware

HP introduced five new workstation models, all of them part of the new merged line called the HP Apollo 9000 Series 400. All of them can be ordered set to run either HP-UX or Domain operating systems, depending on which flavor of UNIX you like. Some of them use the Motorola 68030 chip running at 50 MHz, providing 12 mips, 0.5 MFLOPS performance. Others use the 68040 running at 25 MHz for 20 mips, 3.5 MFLOPS, or the 68040 running at 33 MHz for 26 mips, 4.5 MFLOPS. Those are double-precision MFLOPS for you techie-types. These machines are not slouches.

The HP Apollo 9000 Model 400dl is the low-priced box. It runs the 50-MHz 68030, comes standard with HP's VRX monochrome, 1280 x 1024, 19-inch display, 8 MB of RAM, RS232 and Ethernet for a measly \$4,990 (\$416 per mip). Someday you could upgrade to a 20-mips 68040 for \$2,000, says HP. For comparison, the Sun SLC gives you another half a mip, provides less screen resolution at 1152 x 900 in a 17-inch screen, provides no known upgrade path and has essentially the same price: \$4,995.

The next step up is the HP Apollo 9000 Model 400t running the 50-MHz 68030 chip just like the 400dl, but with many more options, like VRX monochrome or color or Personal VRX, 16-inch or 19-inch monitor, 8 to 64 MB ECC RAM, I/O choices of SCSI, Centronics/Parallel, RS232 or HP-IB. Mass storage is up to 400 MB internal, up to 4.6 GB external. Networking choices include Ethernet (802.3), Apollo Token Ring or IBM Token Ring (802.5). Prices start at \$6,990.

HP Apollo 9000 model 425t has all the same option goodies as the 400t, but sports the racy 25-MHz 68040. It is priced from \$8990. This model, like the two preceding it, is a desktop model. HP Apollo 9000 Model 400s is a desktide model running the 50-MHz 68030 chip. It comes with all the options offered with the 400t above, plus optional TurboVRX graphics, bus options including EISA, ISA and DIO-II, mass storage up to 1.2 GB internal and 4.6 GB external, with a price tag from \$13,990. HP Apollo 9000 Model 433s has all the options listed with the 400s, but runs the 33-MHz 68040 chip, with 26 mips and 4.5 MFLOPS. The new line also includes servers based on the

400s and 433s for shared computation, file serving or peripheral management. Prices for these start at \$12,990.

### VRX Graphics

Graphics products were introduced at the same time. All the new monitors provide 1280 x 1024 resolution standard in 16-inch and 19-inch sizes. The real news is the PersonalVRX and the TurboVRX monitors. PersonalVRX provides up to 270,000 3D vectors per second, and up to 50,000 polygons per second. TurboVRX provides up to 1 million vectors per second and 350,000 polygons per second, equaling anything on the market for graphics firepower.

TurboVRX is worth a few notes on its graphics features. Speed features include sixth-order NURBS, sectioning and capping, interference checking, contouring, deformation animation, polyhedron primitives and fast DMA to frame buffer. TurboVRX realism features include HP's Personal Visualizer, radiosity through progressive refinement, ray tracing, texture mapping with perspective interpolation, anti-aliased vectors and polygons, color map per window, alpha blending, stereoscopic support and video in/out support. Several of these are firsts from HP, which is making itself a big name in high-end graphics. All of these products are now available and are being shipped from HP.

### HP VUE 2.0

Merging the HP and Apollo hardware platforms is just the first step for HP. Yet to come is the complete merger of the two families' operating systems. But in the meantime, HP-UX and Domain users can share the same look and feel in HP VUE, a graphical user interface (GUI) based on X11 windows and OSF/Motif standards.

HP VUE is a visually oriented, mouse-driven shell for both HP-UX and Domain operating systems that provides a graphical file system and network manager, drag and drop icon manipulation, network browser and application launcher and context-sensitive help. Because it uses Motif, the new GUI makes it possible to design custom workspaces that meet industry standards and will remain compatible with future products. HP sees VUE as a first step for customers who wish to make full use of HP NewWave.

HP VUE costs \$550 for either Domain or HP-UX workstations, including Apollo 2500, 3500, 4500 and 10000, as well as HP 9000 Series 300 and 800 workstations. —Bill Sharp



supports Motorola's assertions. "The 68040 is a completely new architecture from the ground up. It's a whole new design, implemented with backward compatibility. By optimizing their instructions, they brought the number of instructions per cycle to 1.3 for the 68040. The 68040 gets all the benefits of a RISC chip and all the benefits of CISC, such as floating point performance. The 68040 is laying the foundation for new growth, including faster versions of this chip, like 40 and 50-MHz versions."

Finally, we might just question the performance specifications for the 68040 chip. It seems the numbers mentioned so far by Motorola and HP are probably too low. WorkGroup's Barney calls the performance numbers "very conservative." Rumors have it that the 25-MHz 68040 chips perform not at the official 20-mip level, but at something more like 23 mips. No comparable conjecture was available for the 33-MHz version of the chip. By the time you read this, these numbers should have settled down to something

real. Why the confusion? Because HP will be the first vendor to ship 68040 products, so to date not even Motorola was sure of the final performance.

### 68000 Family Future

What's out there in the future for the 68000 family and HP? HP's 68000-family products are performing better than ever, and HP has a large financial reason for staying on course, even while it continues to develop its own RISC-based products. HP has 3,200 applications and the industry's largest installed base running on 68000-family products. Keeping these customers happy at a time when some other vendors are sending customers adrift is likely to be lucrative for HP. Motorola estimates that vendors have invested some \$4 billion in software for the 68000 platform and when money talks, HP listens. So will HP bring RISC to market for price-competitive workstation products? You bet your proprietary chips it will. The folks who own 40 to 50 percent of the RISC-based minicomputer

market have been consolidating their workstation customer base on the 68000 platform to date and taking care of business.

With that about under control, HP will focus on bringing RISC to the lower-priced regions of its workstation line to satisfy those customers who want RISC, but don't need the investment of the Series 800 systems. HP has promised new RISC workstations before the end of their current fiscal year, which ends in October. Will that introduction leave 68000 folks in the dust? Not likely, and to keep the customer satisfied that HP will pursue both the 68000 and RISC, HP promises that customers purchasing 68030-based Series 400 products will be able to upgrade later to 68040 systems. In addition, HP also guarantees future upgrades to systems capable of 40-plus mips and "attractive upgrades to leading-edge RISC" workstations.

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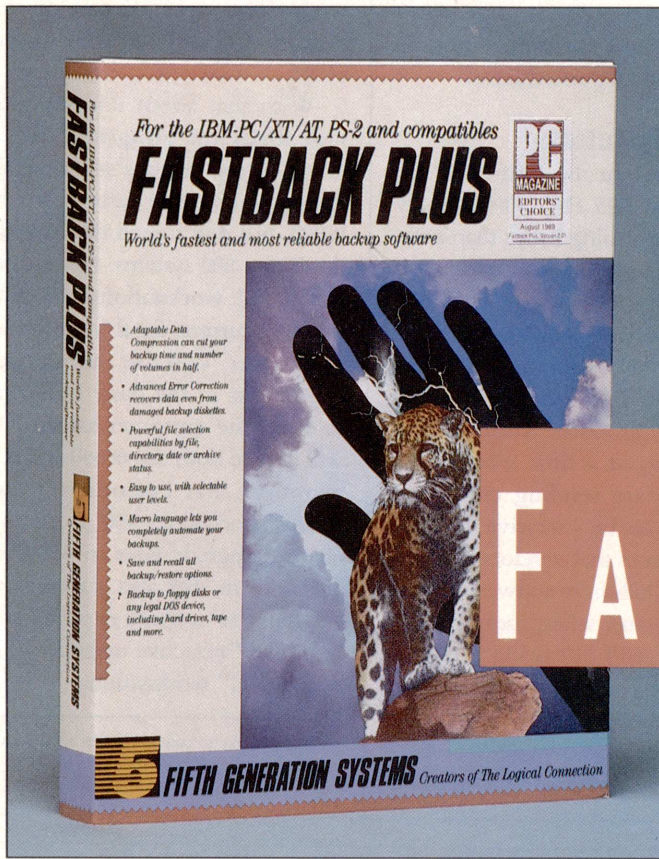
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# FASTBACK PLUS

## Fifth Generation Systems Gives New Meaning To Backup Utilities

When was the last time you backed up your hard disc? Have you considered how long it would take to reconstruct your files if your hard disc stopped working? If you're like most people, backup isn't something you think about often.

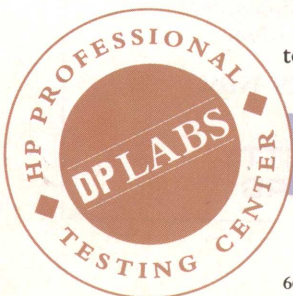
FASTBACK PLUS from Fifth Generation Systems (Baton Rouge, LA) is one of the original backup utilities available on the HP Vectra and IBM PC compatible systems. This improved version of FASTBACK allows you to implement and maintain a disc backup discipline so you can recover your data and programs should your disc drive fail.

FASTBACK PLUS is a complete, easy-to-use application that helps automate

one of the most tedious of computer tasks. The program is structured with pull-down menus, visual and textual modes and context-sensitive help.

This utility runs on most IBM compatible computers. It requires 330K RAM, approximately the same amount of disc storage and any release of MS-DOS above 2.1. It supports a full set of floppy-disc devices, from low-density 360-KB discs to 1.44 MB 3.5-inch media.

Because FASTBACK PLUS performs low-level hardware tests, it may not be compatible with all types of drives and with all terminate and stay resident (TSR) programs. However, Fifth Generation Systems offers suggestions for



Miles B. Kehoe



finding a way to use FASTBACK PLUS on almost any system, and they have excellent support to help you determine how to proceed if you have a problem. For this review I used an ES/12.

### Installation

The installation process is easy and straightforward. The Install utility copies the appropriate files to your hard disc, checks the hardware capabilities of the flexible disc controller and drives, and prepares FASTBACK PLUS for use.

One feature that separates FASTBACK PLUS from many programs is that the manual matches exactly what you see on the screen during installation. A minor point, but I have more confidence in a product when the screens match the documentation.

During installation, the program tells you what it's going to do and gives you the option of omitting one or more steps. I've mentioned before about programs that change my system configuration

without notice, and Fifth Generation Systems shows it's possible to meet the needs of both the user and the software.

### Three User Interfaces

FASTBACK PLUS features three distinct user levels: beginner, experienced and advanced.

The user level is set to beginner upon installation. The menus feature full access to the basic features, but some of the more advanced menu items are invisible. As you progress, more menu items appear and less on-screen help is visible. Of course, the context-sensitive help works equally well at all user levels.

At the advanced level, you can record macro procedures to be used by less experienced users to perform daily backup either from within FASTBACK PLUS or from an MS-DOS batch file. The MACRO language is a collection of keystrokes with some optional prompts, and it allows an advanced user or programmer to prepare easy-to-use scripts for the

novice. This is the kind of tool more applications would do well to implement if the developer expects to gain acceptance within large MIS departments.

### Backup Options

FASTBACK PLUS supports three types of backups: full, incremental and differential.

The full backup is a complete backup of all files and programs on your disc. FASTBACK PLUS uses a special low-level format on the media for added capacity as well as efficient compression technology in the actual file backup.

Both incremental and differential backups store files that have changed since the most recent backup. However, the incremental backup only stores files that have changed since the most recent full or incremental backup. A differential backup stores all files that have changed since the last full backup.

The difference between these two partial backup strategies becomes apparent when you have to restore your data.

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If you have to restore your entire disc and have been using the incremental strategy, you'll have to restore the most recent full backup set (save set) and individually restore each incremental set in the order they were created. However, you're able to restore your system to a particular point in time because the changes made each day are maintained in different incremental sets.

On the other hand, if you had been using a differential strategy, you would restore the original save set and the most recent differential set. You can't restore your system to be like it was last Thursday, but you won't have as many discs to keep, and the restoration should be faster.

Another nice feature is the ability to perform any backup to a hard disc. Why would I ever backup a hard disc to itself? I probably wouldn't. However, if you have more than one hard-disc drive in your system, you can get some security in having a copy of your critical data on a different drive mechanism. Notice I said more than one drive. Having multiple disc-drive IDs in different partitions of the same media doesn't provide any security. Usually, when a disc drive dies, all partitions on that drive are lost.

### Need Partial Backup?

Although different types of backups normally make the most sense when working with an entire hard disc, FASTBACK PLUS specifies wildcard options for inclusion and exclusion.

Suppose you want to perform a *full* backup of all the files in a particular subdirectory that aren't executable programs. You can specify a directory you want backed up, and that all files with a file extension of .EXE are not to be included. In this way, you have all the power you need to insure the safety of your data while minimizing the time spent copying files.

The process of selecting the subdirectory or files to be used in a partial backup is handy. You either can specify the usual MS-DOS wildcard specification, or you can enter a mode that allows you to graphically view your directory tree and select the files to include or exclude by us-

ing a point-and-shoot selection method.

Another reason to perform your backups to a hard disc, is speed. It's easier to let the program continue without inserting dozens of new floppy discs. Once the backup is complete, you can copy the save set to a tape drive or over the network to your host minicomputer. This solves the problem that FASTBACK PLUS won't perform a backup to a tape drive; it's primarily a disc-based backup.

### Macros

I mentioned earlier that the product features the ability to create and use collections of prestored keystrokes, or macros, to automate the backup process. In fact, FASTBACK PLUS includes a record mode that captures the appropriate keystrokes for a particular task as you perform it. You then can invoke FASTBACK PLUS and execute these tasks automatically.

This makes it very easy to automatically perform an incremental or differential backup every time you start the system. The macro files can be edited using a standard ASCII editor, so you can modify the scripts as you see fit. Fifth Generation has included a macro language as well, and you can add message windows and text to any macro file.

### There's More

There are more features that you'll encounter while using FASTBACK PLUS.

Before those long unattended backups to hard disc begin, FASTBACK PLUS estimates the time required for the operation. And, when performing a backup to flexible disc, FASTBACK PLUS will format the media for you.

Finally, FASTBACK PLUS provides extensive reports so you can keep track of what files were actually stored. This gives you even more confidence that the backup you executed was the one you wanted.

### Wish List

Although there's extensive context-sensitive help, the help subsystem doesn't extend to error conditions. Occasionally, something I ask FASTBACK PLUS to do produces an error. The error number and a brief message are displayed in a win-

dow, and the manual includes explanations and suggestions of actions to take to recover from the error. To be consistent with other parts of the program, I'd like to be able to press F1 for context-sensitive help and see the error message and suggestions on the screen.

Also, when I backed up one hard disc onto another, the destination drive became full. FASTBACK PLUS responded by requesting me to put a disc with free space into Drive D: . If D: were a floppy drive, I would understand the request. But the program surely can tell that D: is a hard disc and isn't removable. I'd like to see FASTBACK PLUS ask for a second volume on which it can continue.

One handy feature that I'd like to see added would be the ability to restore files into a different directory on the same disc. As it is sold today, you cannot use FASTBACK PLUS as an efficient way of moving one subdirectory to another on the same disc.

Overall, I'd suggest FASTBACK PLUS to anyone who uses a PC for more than casual use. It's fast and easy-to-use, yet powerful. Don't wait for your hard disc to stop working before you start a regular backup procedure on your system. You'll be glad you did when that inevitable day comes.

## FASTBACK PLUS

**SYSTEM REQUIREMENTS:** IBM PC/XT or compatible with 330K RAM

**PRICE:** \$189 includes unlimited telephone support and product updates

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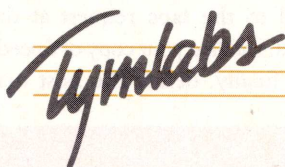


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# DELIVERS

## Lee Merrick Addresses E-Mail System For The HP 3000

Sending a manually typed memo through the interoffice mail describing some whiz-bang feature of your fancy online computer system just isn't right.

If the ratio of workstations (terminals and connected PCs) to employees is high in specific, logically related work groups such as project teams, departments or locations, a good e-mail system can improve performance and productivity by smoothing the flow of information, cut down on needless interruptions and avoid telephone tag.

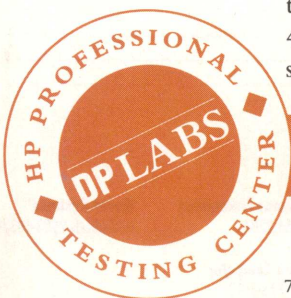
SpeedMAIL, from Lee Merrick & Associates Ltd. (Ontario, Canada), which runs on single or networked (DS/NS) MPE or MPE XL HP 3000s, is a mail system written in Speedware, Infocentre's 4GL system. Hence its name and also some of its pluses and minuses.

If you're already a user of software written in Speedware, then little training or confusion is likely. On the other hand, if you're a solid VPLUS shop, then training/reorientation is almost certain, because SpeedMAIL uses a kind of formatted super character mode. This isn't a criticism. I happen to prefer a character mode system to VPLUS for most applications.

### Installation, Set-Up And Documentation

Installation follows what is probably a now familiar pattern. Restore a job stream-file, enter any necessary passwords, stream the job (actually several cascading jobs) and respond to the tape request at the console. Next, validate your copy of SpeedMAIL. And finally, define the host ma-

John P. Burke





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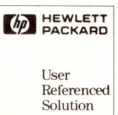
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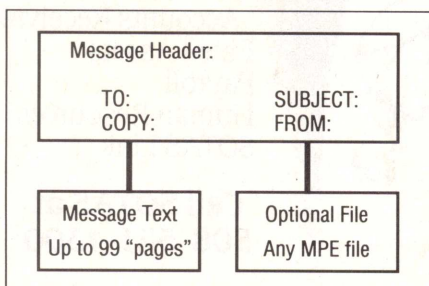
chine, create the IMAGE database with the install program by configuring the number of users (a 50-user system requires about 12K sectors total for programs and databases), and launch the background server job SPMSEVR. The whole process should take less than an hour.

Technically, SpeedMAIL is ready to go. To actually use it, you must first define any other machines in your network and at least a few users. (Multimachine mail networks require DSN/DS 3000 for automatic message transport. A manual transport capability exists for other multimachine configurations.) Setting up the directory of users is a tedious process, at best, with most mail systems, and it could take several hours if you have 100 or more people to enter. Don't worry, it'll be worth the effort.

Documentation comes in the form of two manuals, one for system administration and one for end users. The system administration manual explains all the steps necessary for installing and maintaining your SpeedMAIL network. For your end users, SpeedMAIL has abundant online help, and most people who are somewhat familiar with the HP 3000 will require only a few minutes of personal instruction to become productive SpeedMAIL users.

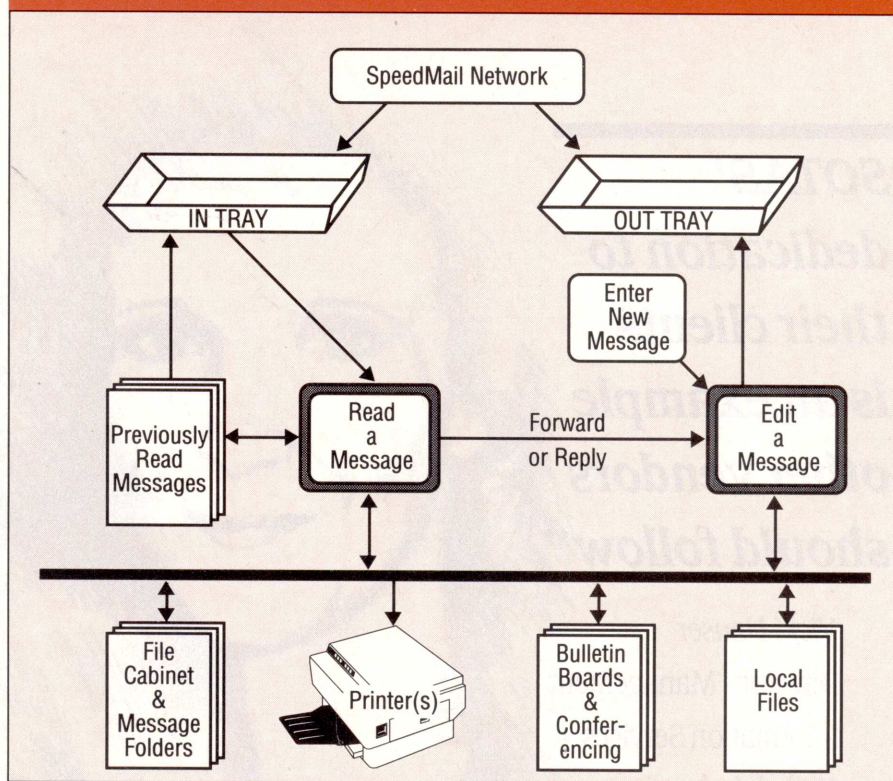
## Features And Impressions

To call SpeedMAIL an e-mail system doesn't tell the whole story. The product literature now talks of SpeedMAIL being a Computer Based Message System (CBMS), which perhaps is a better description. Consider the structure of the SpeedMAIL message below.



This simple yet elegant definition is the basis for a message system with power and flexibility.

## FIGURE 1.



*SpeedMAIL runs on single or networked MPE or MPE XL 3000s.*

Within SpeedMAIL, each user has a personal file cabinet that can contain any number of file folders, which in turn can contain any number of messages. And, each user has control of his or her password, certain configuration options and shorthand, nickname distribution lists.

Messages can be retained in the In tray, filed to a file folder, forwarded, replied to, printed or deleted (automatically or manually). You even can send reminder messages to yourself. Local HP 3000 files can be pasted into or cut from any message, and if you're using Walker Richer & Quinn's Reflection terminal emulator on your PC, the local files can reside on your PC.

SpeedMAIL usernames generally are created by using an individual's actual name and may or may not be associated with an MPE username.account. The mail system directory of users can be searched by name, machine, location, department and even by phonetic match-

ing on last name. Messages can be addressed and carbon copied by name, nickname or distribution list name in the TO: and COPY: fields.

Messages sent by selected users can be logged to another user. Also, messages can be marked confidential to shield them and can be marked priority to override defined transport parameters. Sent messages are held in the Out tray until read by the receiver. You may optionally be beeped at your terminal when new messages arrive. Unfiled messages automatically are deleted after a specific number of days.

Distribution lists may be set up as private or public; e.g., all department heads, all members of department XYZ, etc. Users without terminals can have messages routed to a system printer.

Intermachine transport can be scheduled to automatically occur according to a fixed schedule or manually depending upon network resources available.



## Operations

The background server job, SPMSEVR, must be running (preferably in the CS queue) during normal operation of SpeedMAIL. All information about users and messages (though not the messages themselves) is kept in an IMAGE database that's created at installation time. The SpeedMAIL programs write IMAGE database updates to the command queue SPMAILQ (an MPE message file). SPMSEVR is a reader of SPMAILQ and actually performs the database updates. When SPMAILQ is empty, SPMSEVR suspends, thereby using minimal resources.

Performance on the primary test machine, a rather heavily loaded HP 3000/48, was better than I anticipated given that SpeedMAIL is written in a 4GL and was certainly quite acceptable. The design decision to use a server job to execute the IMAGE updates clearly pays dividends in performance of the user interface, although it can be confusing when updates are not immediate. Note that if you have defined a multiple machine system, then SPMSEVR periodically will give birth to transport jobs to transfer messages between machines.

In a working environment, many messages are of the quick and dirty one paragraph variety and for these the integrated message editor is a bit clunky. I would prefer to see a full-screen editor or something that uses the local editing capabilities of the terminals or the PCs running terminal emulators. Of course, it's very easy to prepare your message outside SpeedMAIL using your favorite editor or word processor.

SpeedMAIL makes heavy use of function keys, which is good. However, the keys don't match up to the menu choices. The key F6 matches to the menu item numbered 5.

These are two minor complaints and do not significantly detract from the overall favorable impression I have of SpeedMAIL.

## Special Features

There are two features I found particularly appealing: the optional (what I call piggy-back) file and bulletin boards.

With piggy-back files you can work on a spreadsheet or word processing document on your PC and transfer the raw binary files complete with a nice descriptive message to one or more people on your HP 3000 network where they can download it to their PC. You must all be using WRQ's Reflection terminal emulator. I used the piggy-back file technique while preparing this article so that I could work from more than one office without schlepping around a floppy disk. It was great!

I like bulletin boards. SpeedMAIL supports multiple public and/or restricted access bulletin boards and computer conferencing via postable bulletin boards. Bulletin board items can be set to self-destruct after a certain number of days and even whole bulletin boards can be automatically purged on specific dates. The bigger your organization, the more you will like the bulletin board feature.

Any organization with more than a handful of users can benefit from having an e-mail system. The type and sophistication necessary will depend upon the needs, structure and sophistication of the organization. If you see your organization benefiting from a full-featured standalone CBMS, then you should evaluate SpeedMAIL for yourself.

## SpeedMAIL

**SYSTEM REQUIREMENTS:** HP 3000 MPE V and MPE XL. HP or HP-compatible terminal or HP-terminal emulation.

**PRICING:** \$3,000 to \$12,000 depending on CPU. Discounts on additional CPUs. Includes one year of support. After the first year, support is charged at the rate of 15 percent of purchase price.

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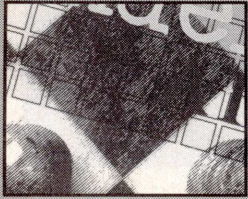
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## RDBMS

Fabian Pascal

## Enforce Integrity Rules To Prevent Data Corruption

# Database Compliance

Databases represent segments of reality. Reality constrains the data representing it in various ways. For example, in our sample database (see Figure 1):

- Every department, employee, project, etc., must be uniquely identified.
- Employees can't be assigned to nonexistent departments, activities can't be allocated to nonexistent projects, etc.
- There may be certain policies restricting salaries or commissions to a certain range.
- Within that range, there may be different restrictions on salaries and commissions.
- The starting dates of allocated activities or employee assignments to them must precede the ending dates, and so on.

Every application affecting the content of the database shouldn't violate these integrity constraints, otherwise the data can be corrupted and, thus, be inaccurate or inconsistent.

Traditionally, the task of preventing violations has been left to the applications (and, thus, the users) themselves. Every application inserting, updating or deleting data must contain special code whose purpose is to prevent data corruption; i.e., enforce integrity rules. But even though users struggle valiantly with this task and even may think that they successfully have protected their data, it would be fair to say that they're fighting a highly ineffective, if not altogether losing battle.

First, application-based integrity enforcement is an awesome task. For even an unrealistically small and simple database like ours, there are many integrity rules that must be identified and properly designed into all the applications for which they are pertinent. And there are many such applications of many kinds.

Second, applications written with current programming languages require extensive procedural integrity code. Such code is difficult and tedious to write, validate for correctness and completeness, test, debug and understand later on. Moreover, such code may not be useable by applications written with different development tools.

Third, the various rules would be scattered, often redundantly, in many applications and, thus, wouldn't be readily visible to users. They can't easily tell whether the database has *overall* protection, if some necessary rules were omitted, if others were unnecessarily duplicated, and if still others conflict with one another.

Fourth, consider what happens when

the database, rules or applications change. The whole painful and costly process starts anew: The affected applications must be identified, the effect of the change on them understood, the code must be modified, etc.

It is estimated that at least 70 percent of the effort invested in application development and maintenance is dedicated to integrity enforcement and, given the circumstances, one must wonder about the efficiency and effectiveness of this

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Figure 1: EMPLOYEES Table

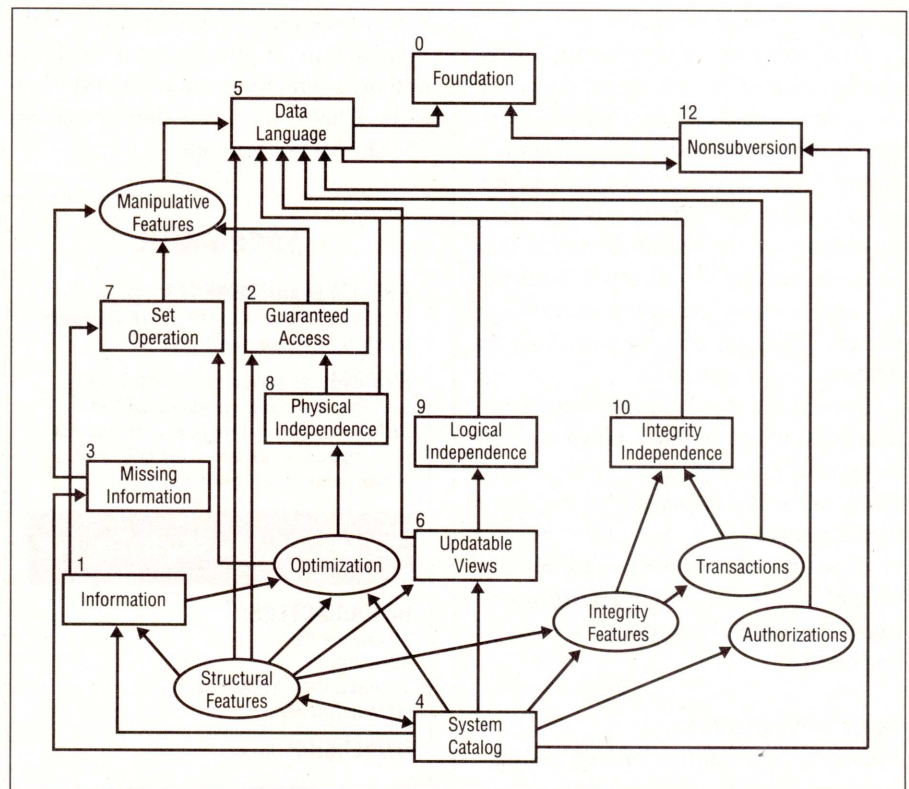


Figure 2: Feature and rule interdependencies.



approach to prevent database corruption. Is there a better way? There is a relational solution to this problem, too.

## Integrity Independence

Among other features, the relational model mandates the DBMS to support the structural features of *keys* and *domains*, and five integrity features:

- Entity (or table) Integrity (EI).
- Referential Integrity (RI).
- Domain Integrity (DI).
- Column Integrity (CI).
- User-Defined Integrity (UI).

Each integrity rule belongs to one of these types of integrity. The Nonsubversion Fidelity Rule (12) prohibits the DBMS from allowing applications to bypass and, thus, possibly subvert any integrity (and security) rule.

Integrity Independence Rule 10 states:

- *Interactive operations and application programs*

should not have to be modified whenever changes to

- *integrity rules*

defined with

- the *data language*

and stored in

- the *system catalog*

are made to the database.

The concept of *integrity independence* is similar to those of *physical* and *logical data independence*. Applications should be insulated from integrity details in the same way in which they are insulated from physical data access and logical database reorganization.

Because the main way of interacting with a DBMS is a *data language*, a relational data language must allow users to define integrity rules for the DBMS, rather than code them into the various applications (in accordance to the Comprehensive Data Language Rule [5]). The system then must be able, with built-in intelligence, to enforce these rules in the database across all applications for which they are pertinent.

EI and RI rules require that the DBMS support primary keys, (PK) and foreign keys, (FK). DI rules require, of course,

**A** vendor may claim that it isn't practical to comply with all the fidelity rules.

support of domains. Hence, Figure 2 shows that compliance with Rule 10 is dependent on support of these structural features of the relational model.

Note that compliance with Rule 10 also requires support of transactions. Transactions are multi operation logical units of work (LUW) that must be executed in an all-or-nothing manner by the DBMS. In other words, if anything goes wrong between the start of the transaction and its end, any operations already applied to the database must be undone by the DBMS, to prevent the corruption of the data by partially executed transactions.

There are two ways in which transactions are related to integrity support. First, partially executed transactions leave the data in an inconsistent state, which is clearly an integrity issue. Second, a possible "failure" may be an attempt to violate an integrity rule. Thus, the DBMS may execute some operations in a transaction and then realize that the next operation violates an integrity rule. It then must recover from this situation by undoing the already executed operations. Transactions and the functions of database recovery and concurrency control will be discussed more thoroughly in a future column. For now it is only important to realize that, as Figure 2 shows, compliance with Rule 10 requires the support of such features.

How would the DBMS know what rules to enforce? Of course, it must store the rules defined by users somewhere. Rule 10, therefore, joins other rules and features in requiring a system catalog, where the rules can be stored and from where they can be enforced by the DBMS for all applications, and reviewed and

changed by users independent of the applications. The system catalog will be discussed in more detail in the future. Note that a nonsubvertible catalog is the mechanism by which Rule 12 is enforced.

This approach solves the problems caused by traditional products and, thus, has tremendous practical significance.

- Users are relieved from replicating integrity code in applications.
- The rules are centrally enforced by the DBMS (and potentially manageable by it).
- Changes won't create a maintenance burden.
- Rules can be reviewed simply by interrogating the system catalog.

## Integrity Is Not Only Referential

For all this to materialize, the DBMS genuinely must implement integrity features in the DBMS back-end, if all front-end tools and applications are to be centrally and automatically protected. If integrity rules are supported by the front-ends, like the shortcuts taken by some vendors, the practical benefits of relational-system-enforced integrity won't be experienced by users.

It may be difficult for vendors to truly comply with Rule 10, but if they don't, the result certainly isn't practical for users. Thus, if you encounter claims that "it isn't practical to comply with all the fidelity rules," be aware that what the vendor really means is that "it isn't practical for us to comply, because it's easier to let you enforce integrity on your own."

Thus, relational integrity claims shouldn't be taken at face value. If users want to ensure that they get true and full practical benefits, they should understand what features must be supported by a relational DBMS, and how, and verify that they are supported. Moreover, users also must verify that front-end tools that are ported from nonrelational to relational databases exploit the integrity features of the latter. — *Fabian Pascal is president of micro-paSQL, Washington, DC.*

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## FIELD SERVICE

Ron Levine

### How To Improve Reliability And Performance

# Give Your Network A Physical

Sooner or later every network manager will need to test the network. Whether you're in charge of installing a new network or keeping a current one in good working order, testing is the key to minimizing downtime, and avoiding costly repairs.

Network testing entails checking the interfaces between your equipment (terminals, computers, peripherals) for any discrepancies that curb their ability to communicate, or pinpointing anything that might alter the data being sent or received.

These data communication discrepancies can be located in several spots, from the source hardware/software to the actual cabling paths to the receiving hardware/software.

There are many phases of network testing, depending on your particular setup, the problem to be solved, and how deep you want to probe the problem before calling in a repair expert (there are quite a few steps that you can take beforehand).

## Proactive Maintenance

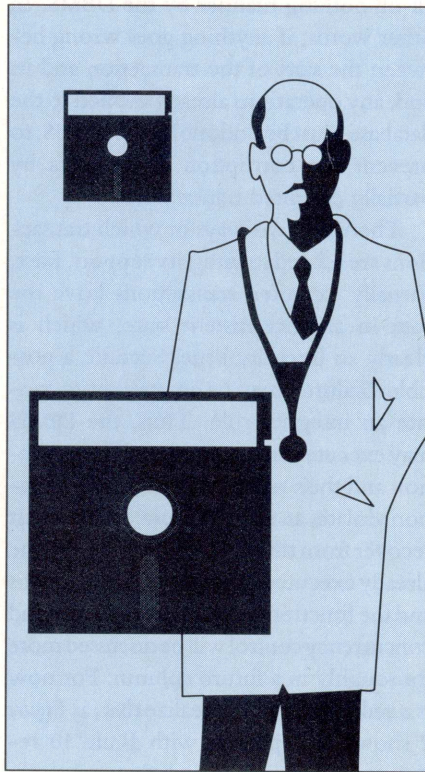
A good, corrective maintenance program doesn't start when the system fails, it must begin while the system is running normally. Proactive maintenance procedures are used at this time.

Proactive maintenance is performed on a running system to detect (and correct) potential problems. It isolates these hidden faults before they become system stoppers.

Also, while the system is running well, you should do some testing to become familiar with your particular system's "fingerprint." In order to isolate a problem, you must be able to recognize when your system is behaving abnormally. On the surface, this is easy. If it won't send

or receive, it's abnormal. However, when you try to go below the surface and find the culprit, things get more tricky, especially if you aren't sure what "normal" is on your network.

Because every system is different as far as equipment, node usage and the work being done, there is no "standard." I suggest collecting measurements at key points throughout your network and saving the results. You should collect a series of performance measurements, some of which would be node-use patterns,



bandwidth usage, type of traffic, cyclic activity during both heavy and light usage, line utilization and data transmission quality.

When your system goes down, the best approach is to try the easiest tests first. You may find the problem without much work, and at the very least rule out some possibilities.

Obviously, the least technical possibility is operator error. Make sure the network is being used properly and that each operator is well trained. Operator error has been found to be a major cause of reported network problems.

Once human error has been eliminated, it's time to try logic. Problems involving a single user usually signify a problem between that terminal and the host. It can be anywhere in that user's terminal, such as, the cable-to-cluster controller, the controller configuration, or the system configuration at the host. Pay particular attention to intermittent problems because these may indicate another user dominating the system at certain times.

Several users on one cluster, all or many of whom report problems, could point to the line from the cluster to the host. Check the cluster controller, multidrop line, modems, or the system configuration at the host end. Again, check for one user dominating the system.

Data communications problems reported by many users on a multidrop system could indicate an overload of either that system, modems, a leased line, or again, system configuration at the host.

## Troubleshooting

There are three layers to network troubleshooting. Layer 1 tests the hardware and cabling that physically connects the equipment. Layer 2 is the software/data link level. Both of these layers use passive testing in which the troubleshooting doesn't interfere with data traffic on the network. However, this does require an available test port in which to connect testing monitors. Layer 3 is the network (management software) level, concerned with switching/routing information and for maintaining connections between systems. At this layer, we switch



to active testing in which the equipment/wiring being tested is actually removed from service.

Although this causes user inconvenience, active testing tends to provide better results.

After operator error, the most common problems are found during Layer 1 troubleshooting. The problem could be as obvious as a loose cable connection or downed phone line (a quick call to the phone company could alleviate a lot of work).

In your mind, isolate the problem to the most probable culprit, then monitor the pins (leads) on both sides of that connection (such as the sending pins of the host and receiving pins of the target terminal, or the entry and exit points of a modem). The testing monitors used at this level are the breakout box and data line monitor. Find the data collected when your system was up and running and compare this to the current "mal-functioning" results. If they match, you haven't yet found the glitch.

The next step is to check for signs of poor line quality. Two obvious indicators are excessive rejects and excessive bit errors during transmission. For this step, a data line monitor or protocol analyzer can be used.

If you're still searching, try using a protocol analyzer to check for valid data or configuration errors.

Assuming that you have checked all recommended Layer 1 possibilities and found nothing amiss, we move to Layer 2 testing. This consists of user-related faults (such as network congestion, a busy phone line, or improper addressing) and device driver, application, or system software faults (very rare). The testing procedures at this layer are dependent upon your type of environment.

Most faults will be found by the completion of this stage. If not, it's usually because the discrepancy was missed during testing or it's not a network-based problem. If you're sure that the problem exists within the network, it's time for Layer 3, active testing. This includes such procedures as simulation testing, network and subscriber emulation testing, and bit error rate testing (BERT). These higher-

level procedures require a protocol analyzer. (It's possible to perform BERT alone using a data line monitor.)

### Test Equipment

When your system does go down, time is a priority. Having the proper troubleshooting tools (including a performance database) helps keep you in control

of the situation. They ensure that a problem can be quickly identified, isolated, and resolved, getting your business back on track in minimal time.

**The Breakout Box:** For low-level monitoring the breakout box works well. It monitors the individual pins of a communications interface to see if that pin or line is being used. This shows the

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user whether the transmission on the pin reached its destination.

For cable-checking or during the installation of a new system, the breakout box is ideal. During installation, the breakout box can simulate the finished wiring, allowing the system to be checked beforehand (cables can be rewired by using the switches and jumpers on the box to open leads). The installer continues to try new combinations until a wiring format is found that allows the

**T**he transmission medium tester is a relatively new device that promises to save considerable time and money because of its ease of use and abilities.

devices to communicate. At this point, it has told you which cables to match up.

Though breakout boxes range from the most basic models that provide just monitoring and testing of data transmission to expanded models with many built-in troubleshooting aids, a breakout box will only detect whether a line is active.

**The Data Line Monitor:** One step up from the breakout box is the data line monitor. This monitor enhances the cable-checking capability of the breakout box by also checking the data itself for errors, monitoring synchronous and asynchronous communication lines for throughput and garbage, and actually capturing bytes in their transmitted formats. It will allow you to observe the flow of transmitted and received data, hold and store data bytes for future reference, display the data in several formats, and perform bit error rate testing (BERT).

Data line monitors have a reputation of being too awkward for field use. Full-featured units have usually run in the \$5,000 range, weighed 20 plus pounds, and were better for in-house use. Recently, however, I have seen some quality data line monitors that were small, lightweight, hand-held and inexpensive.

**The Protocol Analyzer:** A protocol analyzer performs the functions of a data line monitor and has the ability to not only capture data going through the lines, but to understand definitions of various protocols (e.g., X25, SNA). It then disassembles the data and displays it in user-understandable terms.

**The Transmission Medium Tester:** The transmission medium tester (TMT) is for use on local area networks (LANs) only. It's a relatively new device that promises to save considerable time and money because of its ease of use and abilities. In a nutshell, the tester verifies, at the push of a button, the capability of an installed LAN to conduct high-reliability information traffic.

A transmission medium tester will do the following: certify LAN wiring pulled prior to system installation; trace unidentified cabling from the wiring closet to their destination (usually in individual offices); test wire orientation to power/lighting sources to eliminate EMI and identify noise sources by location, frequency, and level; find opens, shorts, and bad connections in a network; check existing wiring (twisted pair, coax, or twinax) to assess whether it can support a digital network; and detect security problems (such as wiretaps).

To understand the usefulness of a transmission medium tester (TMT), I relate the story of the network installation project at the World Trade Center in New York City. While installing the physical layer (wiring for 160 offices on two floors), one man with a TMT took five hours to do a job that normally, without the TMT, takes two men two days to accomplish. In addition, using the old method, one of the men had to be trained in-depth in interpreting the scope waveforms on an expensive tool known as the time domain reflectometer (TDR).



With a transmission medium tester, this training is not needed.

### Wrapping Up

Knowing how to give your network this physical exam will go a long way toward improving your system's availability figures and increase the percentage of time the network operates at its optimum performance level.

Before networking, if a computer went down, the company still continued to do business, though perhaps not quite as efficiently. However, with the rise in networking, we're faced with a different and more frightening problem — no longer does just one computer go down, but the whole system.

Hand in hand with this phenomenon is the trend toward complete computer dependency. Many businesses that previously functioned manually now have almost all business activities computerized. As any manager can understand, when his network goes to lunch, so does his business.

It is advantageous that network testing not be left solely to your maintenance provider. This is because some network testing tasks can be done by in-house staff more cost effectively and in a more timely manner.

For instance, you should have periodic performance measurements done while the system is running normally. Also, when a problem appears, checking for operator error, keeping track of the system discrepancies and when they occur, how often, whether they are intermittent, and what else is going on at the time can best be checked by you in a real-time atmosphere. Not until you reach a step that's beyond your expertise, or you've isolated the problem to specific equipment or cabling on the network, should you call your service vendor.

Becoming familiar with network test equipment and the basics of network testing will save you many hours of service time while improving your networked systems' reliability and performance.

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## PC TIPS

Miles B. Kehoe

Entries in the primary control file for Microsoft Windows, WIN.INI, provide for most of the options you'll see when you start Windows. Because NewWave is based on Windows, WIN.INI also affects many of the parameters you see when using NewWave.

The WIN.INI file is made up of several sections, each beginning with the name of the section enclosed in square brackets, followed by the various parameters in that section.

### Linking Files To Programs

One feature Windows provides that few people seem to use is the ability to start an application by selecting and clicking on the data file name. NewWave provides a much more powerful way to accomplish the same thing, but even standard Windows allows you to link your data files to an application.

The secret to this capability is in the [extensions] section of the WIN.INI file. Figure 1 shows this section as created when you first install windows.

The general format of each entry is as follows:

```
<filetype>=<program> <showfiles>
```

In this case, the first entries are pretty clear: <filetype> represents the three-character file extension for data files that should execute the program <program>. <program> can be any executable file in the current PATH; or a fully qualified name of the executable file. In fact, it even can be a batch file.

The <showfiles> parameter is less clear. It specifies the files that should be listed in the open file window whenever the user requests that an existing file be

# Option Orientation

opened. Perhaps an example will help to clarify this.

The Windows Calendar program has been linked to any data file with a file-type of CAL. (The entry isn't case sensitive). When you click on MILES.CAL, Windows will execute the CALENDAR.EXE file in the current path and automatically load the file MILES.CAL.

If, while in CALENDAR, I choose to open a new calendar, the CALENDAR program will show all files with the file type of CAL because the <showfiles> entry in WIN.INI is ^.CAL. Think of the

up caret (^) as an asterisk (\*) in normal MS-DOS.

Note that the same executable program can be started by files with different file types. The NOTEPAD.EXE program in Figure 1 is such a case. By clicking on any file with a file type of INI or TXT, the NOTEPAD.EXE program will execute.

There's one characteristic of using the same program with two or more file types. While clicking on a file with either filetype will start the program, the open file window will use only the file

TABLE 1	
[Table 1]	
Window	The background color when a window is opened.
WindowText	The text color within all window.
Menu	The color of the menu bar and all pull-down menu boxes.
MenuText	The text color within the menu bar and pull-down menu.
WindowFrame	The color of the thin line which frames the screen.
TitleText	The text color of text in the title bar.
ActiveTitle	The color of the active window's title bar.
InactiveTitle	The color of any inactive windows' title bars.
Scrollbar	The background color in the scroll bar.
Background	The background screen color "behind" Windows.
AppWorkSpace	The color of the application window background.
ActiveBorder	The color of the border around the active window.
InactiveBorder	The color of the border around all inactive windows.

The <windowpart> keywords and their definitions.

TABLE 2			
255	0	0	Bright red
0	255	0	Bright green
0	0	255	Bright blue
128	0	0	Dull red
0	0	0	Black
255	255	255	White
255	255	0	Brown
255	0	255	Purple
0	255	255	Yellow

Color parameter combinations and resulting colors.

FIGURE 1	
[extensions]	
cal=calendar.exe ^.cal	
crd=cardfile.exe ^.crd	
trm=terminal.exe ^.trm	
txt=notepad.exe ^.txt	
ini=notepad.exe ^.ini	
msp=paint.exe ^.msp	
wri=write.exe ^.wri	

[extensions] section of WIN.INI.



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specifications of the first entry in WIN.INI which specifies the program.

For example, if you were to start NOTEPAD.EXE by clicking on the WIN.INI file, the files you'd see by default in the open files window of the NOTEPAD would be those which included a file type of TXT because the

txt=notepad.exe line comes before the ini=notepad.exe line.

### Non-Windows Programs

When you want to use a non-Windows program, you have to provide a file describing the program to Windows. This file should have a file type of PIF (Pro-

gram Information File). You can create it with the PIFEDIT program that comes with Windows.

The basic information in the PIF file is the name of the executable or batch file to run; the directory it's stored in; and the amount of memory to be allocated to the program. PIF files can specify any executable file, whether EXE, COM or BAT. (If you specify a BAT batch file, Windows is smart enough to launch

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**P**IF files can specify any executable file, whether EXE, COM or BAT.

the MS-DOS command interpreter to execute the file).

Once you've created the PIF file, you can execute the non-Windows program either by clicking on the executable file itself or on the PIF file.

When used in the [extensions] section of WIN.INI, you can specify the non-Windows program just as you would a Windows application as long as the PIF exists. The line I use to launch Turbo C whenever I click on a C source file is:

```
C=D:\TC\TC.EXE ^.^C
```

You might wonder why I provide the <showfiles> parameter even to a non-Windows application. After all, Turbo C doesn't use the Windows routines to open a file.

The answer is easy. If you specify the <showfiles> parameter, Windows will pass the file name to the program. If you don't, Windows launches the application but doesn't pass the filename. This means the only way your application can find out which file you clicked on is by including the <showfiles> parameter in the [extensions] section.

### Paths

Whether you're specifying Windows or non-Windows program names in your

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WIN.INI, the executable has to be in the current directory or in the current PATH. This is true for the PIF file as well for non-Windows applications. Of course, if you specify the absolute path to the executable (as I did in the Turbo C example above), you don't need to include that program's directory in the full PATH.

### Setting Your Colors

The next section of the WIN.INI file is [colors]. By default, this section is empty, and you see the default colors when you start Windows.

You can change the default colors for most of the different parts of the Windows environment. The general form of each entry in this section is:

```
<windowpart>=<red> <green> <blue>
```

The <windowpart> is one of the keywords shown below and specifies which part of the Windows environment is to be changed. The color parameters <red>, <green> and <blue> are integer values between 0 and 255 and specify the relative amounts of each color.

The <windowpart> keywords are shown in Table 1. Some combinations of the color parameters and the color they produce are shown in Table 2.

Now that you've seen what you can set these color values to, let me suggest you never change them manually. There is a program called the control.exe that allows you to make several changes to the WIN.INI file automatically. This control panel is especially useful when you want to change colors because you actually can see the changes you're about to make.

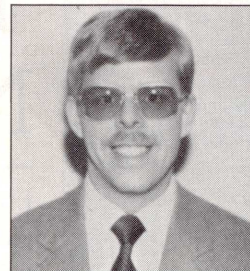
Nonetheless, once you set your colors using the control panel, I suggest you save at least that section of the WIN.INI file. That way you can duplicate just the colors you like on another system, or re-establish them on your system if something happens to your original file.  
—Miles B. Kehoe is an online support manager for Verity Inc., Mountain View, CA.

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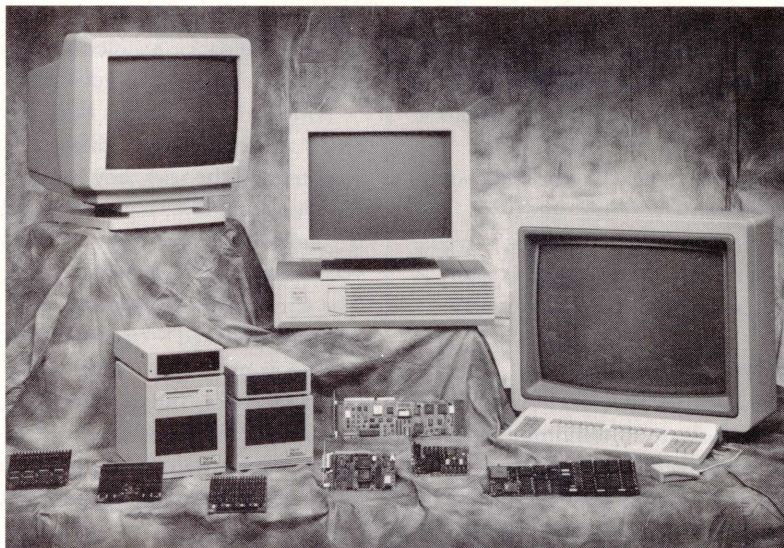
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## NETWORKING

Gordon McLachlan

# The Blob Network Architecture

I was pretty proud of myself when I learned all seven layers

of the OSI model. Ready to conquer the world with my new-found knowledge, I set out in search of a standard network. Then I found out that there are more than 200 standards being shuffled through the bureaucracies of the International Standards Organization (ISO).

After rehabilitation, I am again a functioning member of society, but I've found that making sense of the standards is like pondering infinity: You feel real small and insignificant, and then you either get mystical, block it out of your mind or go rogue. Call me Yoda.

The first cosmic truth I'll reveal is that real networks aren't made out of nice, neat protocol layers. Networks are made of protocol blobs (see *Figure 1*).

The standards straddle the layer boundaries, or split layers into sublayers. This means that those lovely interchangeable layers can't be switched quite as easily as you might expect. Blobs everywhere.

### The Physical Blob

The physical layer specifies how computers or terminals are mechanically and electrically connected to a network.

X.21 defines the digital interface to X.25 packet-switched networks (PSNs). Recognizing the fact that many telco and end-user communications facilities are still analog, X.21 bis incorporates the older analog standards (like RS-232C) we've come to know and love. The X.21 specifications incorporate the V.10, V.11 and V.35 modem standards, which define links slower than 9,600 bps, faster than 9,600 bps and at 48,000 bps, respectively.

The OSI LAN standards are based on the IEEE 802 committee standards for Ethernet (802.3), Token Bus (802.4) and

Token Ring (802.4). Additional specifications for the British slotted-bus LAN and digital fiber-optic interfaces (FDDI) are under development.

The Physical layer of the OSI model seems simple. Figure out what kind of wire you're going to use, and hook up your machines. Surely that can't cause a problem. Sure it can. The physical interface often determines the type of higher level protocols that can be used. Sometimes the higher level layers of the network determine what the lower levels must be.

X.25 connections are character-oriented, and typically low-speed, often less than 9,600 bps. LANs are faster and fire off information in larger bursts. Consequently, the way that data is handled is very different in the two types of networks.

Among LANs, Token Ring and Ethernet use completely different cabling systems, and the way they handle data in the Data Link layer is also very different. If you have a Token Ring Physical layer, you must have a Token Ring Link layer. The same is true of Ethernet. Layers one and two are fused — into a blob.

X.25 is ostensibly a level 3 (Network layer) protocol, but it actually encompasses the first three layers of the OSI model. If you want to use X.25, you also get to use all of its companion protocols.

### The Link Blob

The Link layer is responsible for assembling blocks of data and framing it with control information for transmission.

X.25 requires its own Link layer. This is known as LAPB and was approved as part of the 1984 X.25 specification. X.25 can't use the IEEE 802 Link layer.

For IEEE 802 networks, the Link layer has to be split into two parts, the Media Access Control (MAC) sublayer, which is media dependent and tied to the Physical layer, and the Logical Link Control (LLC)

sublayer, which sits on top of the MAC and presents a "standard" interface to higher level layers.

The LLC isn't really standard because the IEEE 802.3 Ethernet specification cleverly allows the Link layer protocols to be tied to specific Transport protocols. That makes it possible for different Ethernet implementations to use the same equipment, and even share the same cable without being able to interoperate. But they're still "standard." Neat idea, huh?

### The Network Blob

The Network layer assembles the data frames produced by the Link Layer into packets and routes them through the packet-switches to their destinations.

X.25 is character-oriented at its lower levels, and the Link layer data frames don't contain the information necessary to send them through the network to their destination. Consequently, the Network layer is all-important to X.25.

LANs don't really need a Network layer. They don't have to worry about message routing because, by definition, a LAN is local. Everything is supposed to be on the same wire. The fun begins when we try to strap two different X.25 networks or LANs together. This is called internetworking. X.25 doesn't do internets.

Packet-switches that connect different networks are called gateways. If we want two systems on different networks to talk, we need some method of "reaching through" the gateway between their subnetworks to connect them. This method is called an internet protocol.

X.25 doesn't bother itself with how the switching nodes in a network communicate between themselves. It only specifies the interfaces the network nodes present to computer and terminal equipment.

This means that internetworking under X.25 can be accomplished only with some



difficulty and another set of recommendations (CCITT X.75). Unfortunately, we mere mortals aren't allowed to use X.75. It doesn't have enough addresses for the teeming masses, so its use is restricted to public networks. This leaves us up the connectivity creek without a protocol paddle.

## The Transport Blob

Whereas the Network layer is responsible for getting messages to their destinations, the Transport layer has to make sure that they've actually been received properly. It then acknowledges receipt or requests a message retransmission.

The ISO Transport standards provide for five classes of transport service, which correspond to the quality of service (QOS) expected on the network.

Class 0 Transport is used for reliable, connection-oriented packet-switched networks where the Network layer does most of the dirty work.

Connectionless networks with mini-

mal Network layer capabilities and low-quality (error-prone) connections use Class 4 services, which provide the highest levels of integrity checking and error-recovery. All networks don't have to support all of the Transport service classes. The classes that must be used depend on the other protocols in the stack.

## All The Other Blobs

The higher we get in the OSI model, the more the standards begin to diverge. The upper layers are so application- and system-specific that it may be foolish to expect them really to be standard.

Various standards have been proposed and implemented, including the Manufacturing Automation Protocol (MAP), the Technical Office Protocol (TOP) and industry-specific stacks for the airline and banking industries.

Lest I go without mentioning the Blue Monster, don't forget about SNA. It has seven layers, just like OSI, and IBM says it's a standard. That means it's a standard.

No doubt about it.

Let's also not overlook HP's valiant attempts to create new standards. How is all of this high-tech, NewWave, OS/2, object-oriented, cooperative processing stuff supposed to turn into a standard? OSI gives vendors the latitude to make up their own standards if they want.

The only real measure of standards at the upper reaches of the model is how many people buy them. With enough critical mass, anything and everything can be a standard.

This is a theme I've harped on before, but it's my soapbox. There are many workstations and PCs. There are going to be many more. That's the direction from which the high-level standards will come.

Nifty things like OS/2, the UNIX-based Sun Network File Server (NFS) blow the doors off anything currently in the ISO standards repertoire. These are becoming standards real quick. Believe me, if you can just get your iron to internetwork, you'll soon find lots of higher-level stuff to spend your money on. You'll just have to pretend it's more standard than the official scorekeepers say it is.

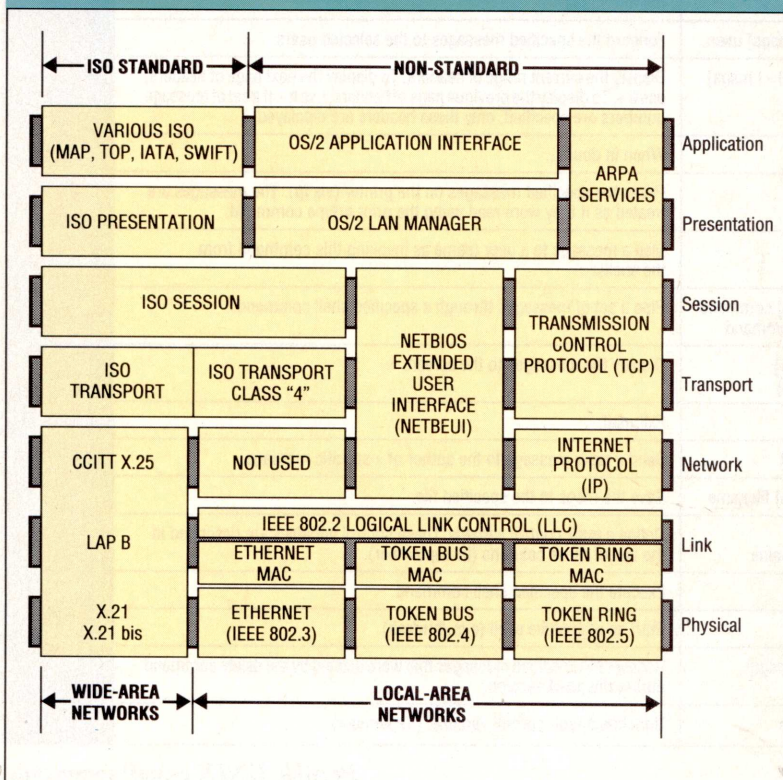
Obviously, there's no native compatibility between the OSI standard LANs and X.25, but, just as obviously, we have to make them work together if we want a shot at the standard higher-level services.

Times are tough, but there's no reason to give up. In fact, the Japanese developed the proper coping technique in the 60s. If Godzilla is threatening Tokyo, you don't try to kill him yourself, you send a rocket-powered turtle after him.

Our rocket-turtle is TCP/IP. We're particularly interested in the IP (Internet Protocol) part, which we don't have, but TCP, (Transmission Control Protocol), is joined at the hip with IP, so we get it by default. Unfortunately, TCP/IP isn't a standard, but, come to think of it, neither are the standards. What the heck, it's close enough for government work. —Gordon McLachlan is a Canton, MI-based independent consultant specializing in networking.

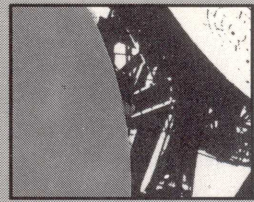
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# FIGURE



ISO/OSI Layers?





UNIX

Andy Feibus

## E-Mail Tips

Electronic mail (e-mail) provides a way to transmit mes-

sages, notes, memos or documents to other users on your own system or on a remote system. It may be used by any user on any system. The UNIX-to-UNIX Copy (UUCP) package is used by e-mail to pass messages between systems connected with a modem. The system's networking services are used to pass e-mail between systems connected with a local-area or wide-area network.

The **mail** command provides a flexible environment for sending and receiving e-mail messages. When sending a message, **mail** provides a way to review and edit the message prior to transmission. When receiving a message, **mail** provides a way to save, delete and respond to the message. On some systems this environment is provided by the **mailx** command. The **mail** (or **mailx**) command is documented in the *UNIX Reference Manuals*.

To find out if you have any e-mail messages to receive, type the command:

```
$ mail
```

If you have no messages to receive, the command responds with:

```
No mail in /usr/spool/mail/amf
```

The file **/usr/spool/mail/amf** is the location for your *mailbox* that's used by e-mail to store any incoming messages for the account. Your mailbox location is determined by the configuration of your e-mail facility. Ask your system administrator (if you need to hunt, look for any directory path containing "**mail**").

To send e-mail to a user on your system, you only need the user's account

name. For example, to send e-mail to user *mary*, use the command:

```
$ mail mary
```

The program then waits for input from you. Type a message:

```
The meeting today is scheduled for
4:30 p.m. Many apologies, but no other
time was available for the room.
```

To finish the message and send it, press **^D** (control-D). **Mail** responds

with **EOT** and transmits the message to the specified user.

To send e-mail to a user on another system, contact your UUCP or network administrator for details concerning how to specify the user's account name. More on sending e-mail messages in next month's column.

### Reading E-Mail

On most systems, the login scripts **/etc/cshrc** and **/etc/profile** are configured to inform you of new messages with the

## TABLE

Command	Action Taken
<b>delete</b> [msgs]	Delete the messages specified. Deleted messages may be recovered (until the mail session ends) by using the undelete command.
<b>edit</b> [msgs]	Put the specified messages into a temporary file and permit the user to edit the messages.
<b>Forward</b> [msgs] user...	Forward the specified messages to the selected users.
<b>headers</b> [+   -   msgs]	Display the current range of headers. To display the next page of headers, use <b>h +</b> ; To display the previous page of headers, use <b>h -</b> . If a set of message numbers are specified, only these headers are displayed.
<b>help</b>	When in doubt...
<b>lpr</b> [msgs]	Prints the specified messages on the printer (via <b>lp</b> ). The messages are treated as if they were read using the <b>print</b> or <b>type</b> command.
<b>mail</b> user	Mail a message to a user (same as invoking this command from the shell).
<b>pipe</b> [msgs] command   [msgs] command	Pipe a set of messages through a specified shell command.
<b>print</b> [msgs] <b>type</b> [msgs]	Display the messages to the screen.
<b>quit</b>	Exit mail.
<b>reply</b> [msg]	Send a reply message to the author of a specific message.
<b>save</b> [msgs] filename	Save the msgs to the specified file.
<b>set</b> name <b>set</b> name=value	Define a <b>mail control variable</b> . These control variables are described in the last of these columns (in September).
<b>!command</b>	Execute the specified shell command.
<b>shell</b>	Start an interactive shell (e.g., <b>/bin/csh</b> ).
<b>undelete</b> [msgs]	Recover the specified messages that were deleted by the <b>delete</b> command during this <b>mail</b> session.
<b>unset</b> name	Undefine a <b>mail</b> control variable. (September)

Possible UNIX e-mail commands.



# TABLE 2

<b>n</b>	Message sequence number <b>n</b> (as shown in the header summary).
<b>.</b>	The current message (the one marked by the > in the header summary).
<b>\$</b>	The last message in the mailbox.
<b>*</b>	All messages (most-often used with <b>delete</b> or <b>lpr</b> commands).
<b>n-m</b>	An inclusive list of message sequence numbers between <b>n</b> and <b>m</b> .
<b>user</b>	All messages sent by the specified user.
<b>:u</b>	All unread messages (marked by <b>U</b> in the header summary).
<b>:r</b>	All read messages.
<b>:d</b>	All deleted messages.

## Message identifiers.

line, "You have mail". Once you receive this message, run **mail** and a list of messages sent to your account is displayed. For example:

```
$ mail
System V Mail (version 3.2) Type ? for help.
"/usr/spool/mail/amf": 2 messages 2 unread
U 2 amf@wat1.UUCP Thu Mar 1 17:54 10/243
  Another msg to me
>U 1 jtk@wat1.UUCP Thu Mar 1 17:54
  9/240 This
    is a message....
?
```

The displayed information is the *header summary* of the messages in your mailbox. The ? indicates that **mail** is in command mode. In command mode, you may delete, read, save or respond to a message in your mailbox. Commands have the following syntax:

```
[command] [msgs] [args]
```

where **command** is the command to execute, **msgs** is a list of messages to manipulate and **args** is based on the requirements of command. If not specified, **command** is the print (or type) command, which displays the selected messages on the screen. If not specified, **msgs** is the current message (which is indicated in the header summary by the > symbol).

The **U** in the first column of the header summary indicates that the message hasn't been read yet. The next column contains the message sequence number. The next column is the name of the user that sent the message. Then comes the date and time that the message was received. The next column is the number of lines/characters contained

in the message. The last column is the subject line from the message.

Some of the commands that may be entered in command mode are shown in *Table 1*. The bold letters of the command are the minimum abbreviation permitted. Refer to the **mail** documentation for other possible commands.

For these commands, **msgs** is a list of message identifiers separated by spaces. The identifiers are listed in *Table 2*.

Some example **mail** commands:

```
d * Delete all messages.
d:r Delete all messages that have been read.
lpr Print the current message.
F 2 jtk Forward message 2 to user jtk
s 1 jdd1 Save message 1 to file jdd1
```

Once a message is read, it's marked (as read). When the **mail** session ends, all marked messages (that weren't deleted) are moved to a secondary **mail** message file, called the **mbox** file, which is normally stored in the file **\$HOME/mbox**, where **\$HOME** is the value of the **HOME** shell environmental variable.

To read messages from your **mbox**, use the **mail** command with the **-f** option:

```
$ mail -f
```

The same commands are available regardless of whether **mail** reads your **mbox** file or your mailbox file. —*Andy Feibus is president of Processware Inc., Atlanta, GA.*

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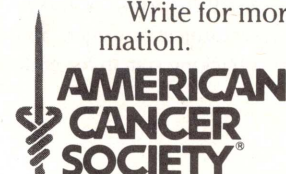
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## Orion Upgrades Apartment Management System

Orion Systems Technology Inc. has announced Version C.00 of AM/3000 II, the apartment management system for the HP 3000. AM/3000 II is a full-function tenant lease processing and general accounting system for managers of multiple properties, which may be owned by multiple owners.

Version C.00 includes a menu system that allows you to initiate any system function directly from the Main Menu, if the function's submenu selection number is known. It also includes spooled printer selection from any menu, additional reporting options, improved Chart of Accounts Maintenance and enhanced information in the Rent Roll Report.

Contact Orion Systems Technology Inc., 325 S. El Dorado, Ste. 102, Mesa, AZ 85202; (602) 894-6983.

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## CDS/SecReview Provides Access Control Features

Chestnut Data Systems has announced a new release of CDS/SecReview, a security audit and access control system designed for HP 3000 computer systems.

CDS/SecReview now provides access control features, specifically, user password aging enforcement and port access controls. Users now can be required to change passwords based on a system-wide or individual aging period. Additionally, dial-in lines can be secured with an assigned "Port" password and time schedule of availability.

Contact Chestnut Data Systems, Park Towne Pl., Ste. S05, 2200 Benjamin Franklin Pkwy., Philadelphia, PA 19130; (215) 557-6607.

Circle 397 on reader card

## GBS Consultants Introduces Problem Tracking System/3000

GBS Consultants has announced Problem Tracking System/3000 (PTS/3000), a software product that provides project managers and programmers with a tracking system for end-

user requests and problems. A history is provided from the initial contact through the final response or resolution.

Written in HP standard products (COBOL II, VPlus, and TurboIMAGE), PTS/3000 requires no additional software or hardware. It also requires minimal training as it is menu, command menu and function key driven. PTS/3000 is delivered with the database defined in Dictionary/3000 for use with 4GL products.

PTS/3000 features date and time sequence tracking, user priority, user requested date, review date, affected files, and more. PTS/3000 also has a built-in electronic mail facility and interfaces with a variety of text editors.

PTS/3000 is priced at \$795.

Contact GBS Consultants, 6087 South Quebec, Ste. 101, Englewood, CO 80111; (800) 722-7007 or (303) 721-0770.

Circle 388 on reader card

## Windows 3.0 Users Gain Access To HP Color Printer

Hewlett-Packard has announced a software driver that allows Microsoft Windows 3.0 users to print with the HP PaintJet and PaintJet XL color-graphics printers.

HP also introduced an improved version of the HP PaintJet printer driver for Windows

2.1 that includes support for the HP PaintJet XL printer.

With the new Windows 3.0 and 2.1 drivers, users can print documents up to five times faster than was possible with the original driver for Windows 2.1.

HP is introducing 26 bitmap fonts for use with the HP PaintJet printer series Windows 3.0 driver and the new HP PaintJet printer driver for Windows 2.1, ranging in size from 8 to 48 points, these fonts are in the CG Times and Univers typefaces.

## Provident Recovery Offers Onsite Disaster Recovery

Provident Recovery Systems has announced Relocatable Emergency Data Centers that are mobilized to the client site for disaster recovery. Environmentally controlled, computer-ready facilities arrive at the affected "home" site to reestablish data processing operations and communications.

Keeping staff at "home" rather than at a remote location allows for reduced cost, logistics and trauma following a data center disaster.

Provident will deliver and install an emergency data center, but also coordinates reconnection of vital communications, hardware replacement and multiple other

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Command: _____		Your Company Name _____		Type: _____	PROBLEM
Problem: _____		PROBLEM TRACKING SYSTEM		Status: _____	Class: _____
Alt Id: _____					
<b>REQUESTOR</b>					
User: _____		User Priority: _____		Date: _____	
Dept: _____		Requested Due Date: _____			
Description: _____					
<b>ASSIGNMENTS</b>					
Leader: _____				Budget / Actual	
Analyst: _____				/ /	
Program: _____				/ /	
<b>CURRENT</b>					
L/A/P/A: _____				Assigned: _____	
Action: _____				Due: _____	
System: _____		Sub-System: _____			
Complexity: _____		Priority: _____			
Due-Date: _____		Review Date: _____			
Files Affected: _____					
Exit Test	Assign	Resolve	E-Mail	Problem	Main



phases of the recovery process. Diesel generated power is also provided, should local power be unavailable. Because Provident facilities are available in 300-square-foot increments, recovery processing can be a mirror image of the current data center environment, whatever the hardware requirements, rather than a scaled down "disaster mode" operation. Contact Provident Recovery Systems, 2000 Regency Pkwy., Ste. 255, Cary, NC 27511-8507; (919) 481-0011.

Circle 372 on reader card

### **Pinnacle Data Systems Offers HPX Series For HP 9000/300**

Pinnacle Data Systems Inc. has announced the availability of the HPX Series mass storage subsystems for HP 9000/300 Series workstations and file servers.

The HPX Series subsystems are based on genuine HP SCSI disc assemblies. They carry a full five-year warranty and have a rated MTBF of 150,000 hours. These 16.5 ms average access drives include detailed installation instructions for 9000/300 series and full installation technical support. Systems are available in 660-MB and 1.3-GB (formatted) configurations in both shoebox enclosures as well as cabinets suitable for placement inside HP system towers. Optical, DAT and 8 mm drives also are available.

Single quantity pricing for the 660-MB shoebox unit is \$3,495. The 660-MB tower mount unit is priced at \$3,895. The 1.3-GB units are priced at \$6,995 for both tower mount and shoebox styles.

Contact Pinnacle Data Systems Inc., 1350 W. Fifth Ave., Ste. 22, Columbus, OH 43212; (614) 487-1150.

Circle 399 on reader card

### **CHART\*PRO Designed For Business Graphics**

Interactive Solutions Corp. has announced CHART\*PRO, a new generation of graphics software for personal computers and HP 9000 and HP 3000 minicomputers. CHART\*PRO is a complete graphics and charting package designed for professional users in all business graphics applications.

CHART\*PRO provides graphics features previously found only on mainframe-based systems. It handles up to 2,000 points per line, up to 32 lines on a single chart; allows for control over most chart elements; and has built-in analysis, math and statistical functions.

Single copy prices start at \$395 for

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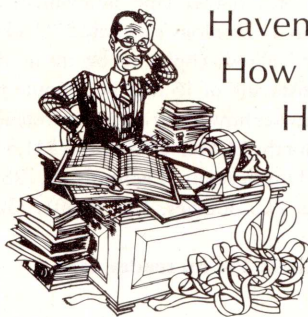
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Contact Interactive Solutions Corp., Route 1, Box 500, Eastsound, WA 98245; (206) 376-5085; (800) 545-4723.

**Circle 392 on reader card**

## QMS Announces Multiple Printer Support Option

QMS has introduced the Option 903 upgrade for its QMS PrintLink print server. The Option 903 is a field-installable, board upgrade that expands the printer support capabilities of a PrintLink print server from one to three printers. With the Option 903 upgrade, users can connect either one RS-232 (DTR) serial and two Centronics parallel printers, or three Centronics parallel printers to a single Printlink print server.

The PrintLink print server acts as an independent network node that connects, via

contained on the 8 mm tape cartridges used in EXABYTE Tape Drives.

The ECHO-8000 can produce as many as 12 copies of a master tape simultaneously. Duplication Technology's patented "Shadow Technique" allows copies to be made at a sustained data rate of 15 MB per minute per drive, no matter how many drives are installed.

Prices for the ECHO-8000 start at \$41,500. Contact Duplication Technology, 2830 Wilderness Pl., Boulder, CO 80301; (303) 444-6157.

**Circle 394 on reader card**

## Holland House Updates UNISPOOL

Holland House has announced UNISPOOL, Release 3.4. It runs in native mode and is compatible with MPE XL 2.1 and the HP native mode spooler.

Enhancements include a distribution feature

reports; and an enhanced set command to set up default UNISPOOL environment variables. Contact Holland House, P.O. Box 1749, Beeville, TX 78102; (512) 287-3417.

**Circle 390 on reader card**

## Pacific Data Offers Printer Option Software For LANs

Pacific Data Products has announced the availability of Brightwork's PS-Print software, PacificPrint, a printer option software for use with two of its emulation cartridges for HP LaserJet printers: PacificPage, a PostScript language emulation cartridge, and Plotter in a Cartridge, which provides fast HP-GL output on a laser printer.

When used together with Plotter in a Cartridge and Pacific Page, PacificPrint enables users to turn their networked laser printers into PostScript or HP-GL compatible printers, while continuing to use them in their native PCL mode.

PacificPrint also provides a complete printing system for networks. It lets any user print to any number, attached to any PC, anywhere on the LAN. Each fileserver can have an unlimited number of print servers and any PC can host single or multiple printers in dedicated or nondedicated mode.

Contact Pacific Data Products, 9125 Rehco Rd., San Diego, CA 92121; (619) 552-0880.

**Circle 381 on reader card**

## Executive Information System Runs Under UNIX

Pilot Executive Software has announced the first Executive Information System (EIS) to run under UNIX. Pilot's EIS development environment and its suite of EIS templates, including its EIS/G series of code-generating applications, now run on HP 9000 Series 800 computers under HP-UX.

The Pilot EIS product is available for four different host environments: HP-UX, VMS, VM/CMS and MVS.

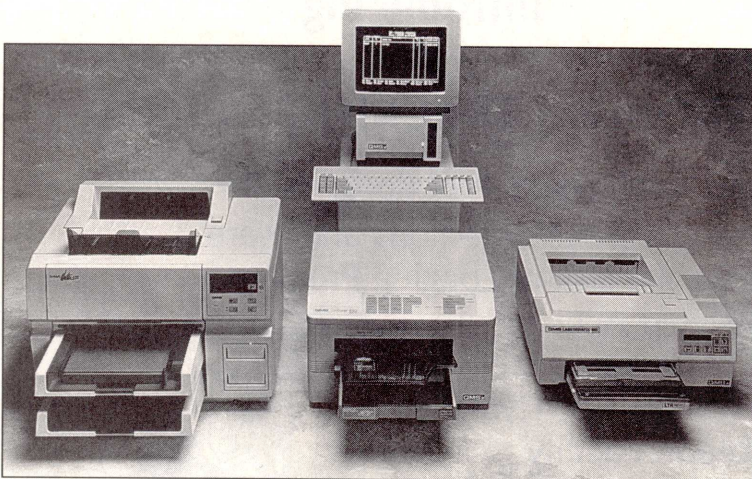
Contact Pilot Executive Software, 40 Broad St., Boston, MA 02109; (617) 350-7035.

**Circle 393 on reader card**

## WINDOWS 2397 Runs Under X-Windows 11

Zyxxomma Ltd. has released WINDOWS 2397, a full-block mode HP2397 color graphics terminal emulator for the HP 9000 Series 300 and 800 workstations running HP-UX.

Designed to run under X-Windows 11 within UNIX System V (HP-UX), WIN-



**QMS introduces PrintLink Option 903, a multiple printer support upgrade for the QMS PrintLink**

thin- or thick-wire, to any IEEE 802.3 Ethernet network supporting TCP/IP commands. The PrintLink print server supports QMS ColorScript, QMS KISS, QMS Lasergrafix, QMS-PS and QMS SmartWriter printers and can simultaneously handle printer input from up to seven users on the network.

Contact QMS Inc., One Magnum Pass, Mobile, AL 36618; (800) 631-2692 ext. 908.

**Circle 382 on reader card**

## ECHO-8000 Features Shadow Technique

Duplication Technology has announced the ECHO-8000, a high-speed, standalone tape duplicator designed to reproduce the data

that enables users to create distribution lists and apply an individual banner to each copy of the spoolfile distributed. In Version 3.4, spoolfiles can be viewed before printing and if the user chooses the entire spoolfile or parts of it can be printed to a printer slave to a terminal or PC.

UNISPOOL 3.4 also has added support for those printers spooled by MPE and not controlled by UNISPOOL. Other features include full support of the MPE run command including all MPE parameters; an enhanced command abbreviation feature that allows parameter substitution (this will enable simulation of HP native mode commands); enhanced report formatting capabilities; an increased number of statistics for spoolfile



## NEW PRODUCTS

DOWS 2397 provides the means of emulating one or more HP2397 color graphics terminal, each with its own X-Windows 11 window. This means that the HP 9000 user now has access to all existing HP2397 compatible block mode and color graphics applications from his bit mapped workstation display.

Contact Zyxomma Ltd., 40 Littledown Dr., Queens Park, Bourne, Dorset BH7 7AQ, England; 0202 395453.

**Circle 395 on reader card**

### MFS Announces Fractional T-1 Services

Metropolitan Fiber Systems Inc. has announced Fractional T-1 Service (FT-1), a service that enables customers of its nationwide local access fiber optic networks to transmit data at high speeds without paying the higher rates for Digital Data Service (DDS).

The MFS FT-1 service allows customers to use DS-OS at either 56K bps or 64K bps clear channel. This enables customers to run at all DDS speeds, including 2.4K bps, 4.8K bps, 9.6K bps and 56K bps. Additionally, a customer may utilize the service for either international or domestic compressed video and voice, subrate data multiplexing, and digital facsimile transmission.

Contact Metropolitan Fiber Systems Inc., One Tower Rd., Ste. 1600, Oak Brook Terrace, IL 60181; (708) 218-7262.

**Circle 387 on reader card**

### Dataram Offers Memory Expansion For 9000/340 Users

Dataram Corp. has introduced a hardware and software compatible memory expansion product, DR-9340, for HP 9000/340 workstation users.

Its features include, workstation memory expansion to 16 MB, lifetime warrant, surface mount technology, plug-in installation and overnight spare part replacement. Each DR-9340 is designed to incorporate 1 Mbit, Nibble Mode, 100 nS Dynamic RAM's (DRAMs).

Price for the DR-9340 memory expansion board is \$2,200.

Contact Dataram Corp., P.O. Box 7528, Princeton, NJ 08543-7528; (609) 799-0071.

**Circle 367 on reader card**

### OCS Librarian Provides Version Control Across Multiple CPUs

Operations Control Systems (OCS) has announced that its Librarian package for HP 3000 computer systems now distributes

software and data updates to remote sites and manages multiple CPUs at the same site. It supports HP's high-end systems with the functionality of mainframe data center software.

Librarian utilizes high-speed telecommunications technology to control remote machines, maintain audit trails and perform transfer activities. With Librarian, users automatically can move entire applications and data files across machines, while retaining the integrity of application packages. Once the files are transferred, Librarian ensures that the most recent copy of a file is available for use. Contact OCS, 560 San Antonio Rd., Palo Alto, CA 94306; (415) 493-4122.

**Circle 385 on reader card**

### Unison Upgrades MAESTRO And SpoolMate

Unison Software has announced new releases of its batch job manager, MAESTRO, and its spool file manager, SpoolMate. New features in MAESTRO C.01 include: new calendar features, user-streamed job queues, logon insertion, and more.

New features in SpoolMate B.01 include: support of HP's new Native Node spooler, new spool file viewing capabilities, support of non-spoiled device printing, and more. Contact Unison Software, 675 Almanor Ave., Sunnyvale, CA 94086; (408) 245-3000.

**Circle 384 on reader card**

### BSW Introduces InterOFFICE/XL For HP DeskManager

The Boston Software Works (BSW) has announced InterOFFICE/XL, an addition to BSW's family of InterOFFICE electronic mail gateway products.

InterOFFICE/XL provides transparent electronic mail gateway services between HP's DeskManager, DEC's ALL-IN-1 and Wang Laboratories' VS OFFICE office automation products. Transparent electronic mail gateway connectivity between these office automation products is achieved by connecting InterOFFICE/XL with its companion components InterOFFICE/VAX (DEC ALL-IN-1 gateway) or InterOFFICE/VS (Wang VS OFFICE gateway). InterOFFICE/XL is a software-only product that installs on a HP MPE XL system running HP's DeskManager office automation product.

Contact The Boston Software Works, 120 Fulton St., Boston, MA 02109; (617) 367-6846.

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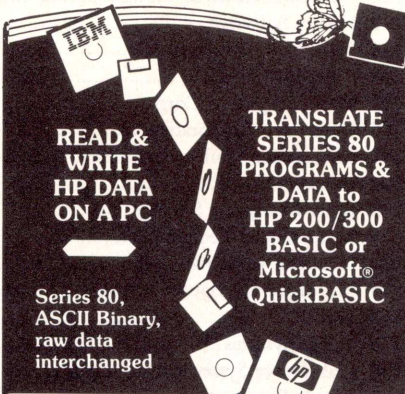
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# ADVERTISERS INDEX

Reader Service Number	Page
158 Access Data .....	79
104 Adager .....	37
163 Aldon Computer Group .....	82
171 Arch Associates .....	78
106 Bering Industries .....	17
109 Bradmark Computer Systems .....	63
108 Bradmark Computer Systems .I.B. Cover	
151 Clearpoint, Inc. ....	47
261 Cognos Corporation .....	I.F. Cover, 1
101 Computech Systems Corp. ....	91
167 Computer Solutions .....	40
240 Dataram Corporation .....	45
193 Digital Micronics .....	83
166 Digital Products .....	53
113 Dynamic Information Systems Corp. ...	13
115 Equinox Systems, Inc. ....	55
116 Equinox Systems, Inc. ....	57
117 Equinox Systems, Inc. ....	59
188 EWC .....	58
164 GBS Consultants .....	89
252 Hermes Softlab .....	4
253 Hermes Softlab .....	4
254 Hermes Softlab .....	4
255 Hermes Softlab .....	4
256 Hermes Softlab .....	4
119 Herstal Automation Ltd. ....	77
147 Hewlett Packard .....	65
Hewlett Packard .....	5
248 Hewlett Packard .....	49

Reader Service Number	Page
120 Hi-Comp America .....	39
121 Hillary Software .....	53
244 Hypoint Technology .....	73
122 IEM, Inc. ....	2
262 IMACS Systems Corp. ....	11
156 Infocentre Corporation .....	41
247 Information Builders .....	43
249 INTEROP Inc. ....	21
185 Kelly Computer Systems .....	19
130 Martinsound Technologies .....	61
182 Network Research Corp. ....	23
173 Northgate Computer Systems .....	6-7
152 NSD, Inc. ....	32
258 O'Pin Systems .....	25
260 Oak Grove Systems, Inc. ....	12
Oracle Corporation .....	9
195 Oregon Software .....	35
264 Precision Visuals, Inc. ....	15
Professional Press .....	33
148 SOTAS International .....	71
132 SST .....	35
139 Tymlabs Corp. ....	69
243 Tymlabs Corp. ....	51
140 Tymlabs Corp. ....	31
142 Unified Software Systems .....	67
145 Walker Richer & Quinn .....	29
146 Walker Richer & Quinn .....	B. Cover
237 Zubair Interfaces .....	87

## [ CALENDAR ]

### [AUGUST]

**20-23:** 1990 INTEREX HP Users Conference will be held at the John B. Hynes Veterans Memorial Convention Center, Boston, MA. For more information call (408) 738-4848.

**26-29:** NCGA is sponsoring GIS '90, its fourth annual conference and exposition dedicated to mapping and GIS technology at the Westin Galleria, Houston, TX. Call (703) 698-9600.

### [SEPTEMBER]

**9-13:** The 1990 Lasers in Graphics (LIG) and Electronic Design in Print (EDP) conferences are scheduled concurrently in Orlando, FL. Call Patrice Dunn, (619) 758-9460.

**11:** MTLRUG is holding its quarterly meeting at Dorval Airport Hilton, Canada. Call (514) 931-6187.

**19:** The British Columbia Regional Users Group (BCRUG) is sponsoring a vendor show in Vancouver, B.C. Call Randy Cliff,

(604) 661-8048. Vendors call Frances Bryant, (604) 643-5538.

### [OCTOBER]

**11-12:** NEVCAL '90, a regional user group conference is being held at Caesar's Lake Tahoe Resort Hotel/Casino, Stateline, Nev. For vendor registration call (916) 544-6474, ext. 281; for paper submission call Glen Gollick, (916) 444-9304.

### [NOVEMBER]

**28:** The British Columbia Regional users Group (BCRUG) is holding a dinner meeting. Discussion topic is "Disaster Recovery & Backup Options." Call Randy Cliff, (604) 661-8048.

**28-30:** NCGA, is sponsoring "Global Advanced Manufacturing Solutions," in Paris, France. The seminar will examine the modernization of European manufacturing facilities through the use of CAD/CAM technology. Call (703) 698-9600.

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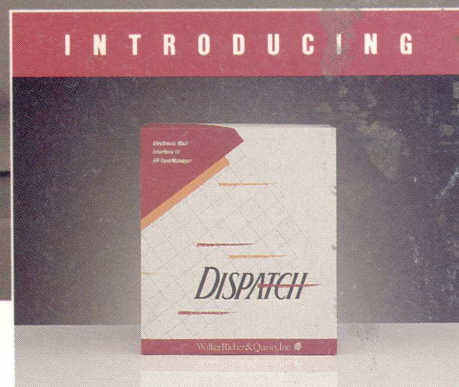
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